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Editorial

This issue of NIU *Journal of Educational Research* touches on Music Education, Environmental Education, Health Security Education, Technological Education in Curriculum Management, as well as Agricultural Education.

One of the papers, in this issue, argues that music education cannot be achieved unless there are enough professionally trained, efficient, committed, and effective teachers. It is necessary to lay much emphasis on the training of music education teachers, products of which will be responsible for the implementation of the aims and objectives of music education programs in the pre-primary, primary, secondary, and tertiary institutions in Nigeria.

Another paper also reveals that the educational system is witnessing digital transformation driven by technological advancement which seems promising. To keep pace with this novel phenomenon and benefit from the usage, management education needs to equip teachers with the knowledge and skills necessary to leverage this technological advancement through its integration in curriculum. This paper therefore examines the technology to be deployed to the classroom for effective management of students, its benefits, potential approaches and considerations for successful implementation.

On the whole, this issue of *NIU Journal of Educational Research* features many empirical and theoretical based articles which can be of great benefit to every reader.

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Music Education in the Senior Secondary Schools in Nigeria: An Overview and the Experience

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Abstract. The objective of this paper is to examine the current state of music education in Nigerian Senior Secondary Schools and how music teachers will adopt an effective transformation in music education at all levels in Senior Secondary Schools. This study is to enable music teachers /educators to reposition and re-strategize themselves for the development of music education in Nigerian schools. The survey method is very useful to this study. There are three aspects to survey methods as used in the study. These are: (1) observation, (2) interview, and (3) questionnaire. One hundred (100) senior secondary schools (SSS) students from five different secondary schools including public, private girls only, boys only, and co-educational found within Ibadan municipality of Oyo State, Nigeria, and situated in different local governments (Ibadan North, Ibadan North-East and Ibadan South-West) were used for the study. The outcome of the study shows that the bias of government educational policies in favour of core science and science-based disciplines is a significant issue that will continue to affect the listing of music as a core- subject in Junior and Senior Secondary schools. Nigerian music teachers have continually agitated for better funding of the music program in the school systems by the government and its agencies. In recent times, the teaching of music in Nigerian schools was incorporated and merged into the CCA program. It is realized in this new curriculum that the four (4) different areas of study are merged to form a subject called CCA: fine art, music, drama, and craft. For music education in Nigeria to improve in standard and output, it should be given a solid foundation at the Nursery/Primary school level. In conclusion, all the above aims of music education cannot be achieved unless there are enough professionally trained, efficient, committed, and effective teachers. It is necessary to lay much emphasis on the training of music education teachers, products of which will be responsible for the implementation of the aims and objectives of music education programs in the pre-primary, primary, secondary, and tertiary institutions in Nigeria.

Keywords: Music, Education, Secondary, Schools, Experience.

1. Introduction

Nigerian music education generally needs a complete overhauling to make a meaningful impact in all ramifications. The form of teaching and learning of music in Nigerian senior secondary schools has changed in principles and practice, especially since the introduction of CCA into the Curriculum in Nigeria Schools. It is in light of this scenario that this paper call for reformation in the teaching of music in Senior Secondary Schools in Nigeria.

For Music Education in Nigerian Senior Secondary Schools to develop to the expected level, music as a subject in the school program must be strong and vibrant. Relevant and more dynamic Music Education philosophy has to be in place. This then calls for total reformation and overhauling.

Several Nigerian scholars have analyzed and prescribed Music Education among whom were Omibiyi – Obidike (2008), Okafor (2005), Nzewe (2003), and Adeogun (2000). Ekwueme (2005), Idolor (2001), Faseun (2008), Adedeji & Ajewole (2008). Most of the works highlighted methodologies and performances; reconstructed the history, listed areas of inadequacies, and projected the future of Music Education in Nigeria. Unfortunately, most of the concepts and recommendations by the Scholars have not been realized to date. To say the least, things

are not in good shape in contemporary senior secondary Music Education in Nigeria today. The Notion of Music Education could be seen from two different perspectives:

- The General sense
- The Specialized area or field in music studies. We tend to mix the two ignorantly and this had hampered the development badly.

The General Sense: Music Education encompasses the teaching and learning of music from Nursery to University levels. It includes the teaching of musicology music theory, performance, composition, music technology, and other specialized areas. Consequently, music education/teaching here includes anyone who knows or has studied music and passes the knowledge to others.

The Specialized Sense: Music Education deals with the technicalities of Music pedagogy. It zeroes in on the science of teaching and learning, methodologies, problems, and psychology, among other things. Music Education in this sense is restrictive. Consequently, Music Education/teaching here does not involve everybody. It is rather limited to specialists in Music Education who have studied the nitty-gritty of music pedagogy.

There is a need for re-branding the state of music education in Nigerian senior secondary schools. It is part of the positive transformation needed. Now, whether the Nigerian government is serious about the program (Music as a subject) in the school or not, I am concerned about having music as a core- subject in the school program. Music as a vocational subject should be taught as a subject in Nigerian Senior Secondary schools and music teachers /educators should radically pursue this.

1.1 Statement of the Problem

The teaching of music as a school subject over the years has been impeded by several factors. The main objective of this study is to collect accurate information on the state of music education programs in Nigerian senior secondary schools as too many people often discussed the situation of music education without the necessary data. For an in-depth study, the sub-problems arising from the foregoing are:

- Could the reason for the poor performance in the music education program be due to studying as a non-core subject?
- Could it be that the students do not grasp some music concepts in theory and applied music?
- What instructional facilities should music teachers adopt in music education programs?
- Is the condition under which the teaching of music takes place conducive to learning?
- Are there adequate teaching materials and musical instruments for music education programs in Nigerian secondary schools?

1.2 Aim and Objectives of the Study

The objective of this paper is to examine the current state of Music Education in Nigerian Senior Secondary Schools and how music teachers will adopt an effective transformation in Music Education at all levels in Senior Secondary Schools.

The purpose of this study is to enable music teachers /educators to reposition and re-strategize themselves for the development of music education in Nigerian schools.

1.3 The Rationale for the Study

The following rationales are stated for the study:

- To look at the factors responsible for the present standard of music education in Nigerian senior secondary schools.
- This research takes a look at the general situation of teaching music in Nigerian senior secondary schools.
- It examines whether the reformation process in music education will bring about significant improvement in the performance of students in music in senior secondary schools.

1.4 Theoretical Framework

This study used the transformative theory as a theoretical framework.

The transformative theory has to do with the concept of positive change as a goal in any academic enterprise. It is rooted in the belief that academic enterprises can be tailored to bring positive change to individuals, systems, and societies. One of the fields that have applied the transformative theory extensively is the educational system.

Adedeji (2013) noted that today, transformative education is a growing dimension in education studies. One of its promotional outlets is the Journal of

Transformative Education, first published by Sage Publishers in 2003. Also, the Centre for Transformative Education is a new educational initiative that offers to empower educational programs to help transform societies into their potential.

Ada retrieved from e How.Com) noted that transformative education refers to a way of teaching that transforms both the teacher and the student. Transformative education has been described as both a process and product of education the process of authentically engaging with your students, and then your content leads to producing positive change.

Dickson (2007) succinctly remarks that to support today's learning outcomes, the focus of education must shift from information transfer to identity development (transformation). It is on the above lines of thought that the view expressed in this paper is based.

2. Research Methodology

We have found the survey method very useful to this study. There are three aspects to survey methods as used in the study. These are:
(1) observation
(2) interview
(3) questionnaire

The three aspects are employed to collect the necessary data for the study. The survey method is selected for the following reasons:

- It seeks a response directly from the individual to be studied
- It is adequate for representative sampling and
- It allows carrying out the research in the natural settings of the individuals to be studied.

2.1 Sample

One hundred (100) senior secondary schools (SSS) students from five different secondary schools including public, private girls only, boys only, and co-educational found within Ibadan municipality of Oyo State, Nigeria, and situated in different local governments (Ibadan North, Ibadan North-East and Ibadan South – West) were used for the study namely:

- Saint Loius Grammar School, Mokola, Ibadan
- Saint Gabriel's Secondary Commercial School, Mokola, Ibadan
- Loyola College, Ibadan
- International School, University of Ibadan
- United Comprehensive Girls College, Molete, Ibadan.

Eight (8) music teachers were selected from five Secondary Schools. Three (3) teachers from one school, two (2) teachers from another school, and one (1) teacher each from the other school. A survey on the current state of music in Nigeria was conducted in each of the five schools with a focus on the music education program.

SSS 1- III students in each of the five schools were used as the target population. Oral interviews were conducted with the music teachers in the selected schools. Classroom observation on the curriculum and instructional facilities for music education took place with music teachers in each of the schools concerned in Ibadan. A total number of eight classroom lessons were observed. In addition, the writer visited a number of these schools to collect first-hand information about the conditions existing there.

Questionnaires were directly administered with a focus on curriculum (UBE), and instructional facilities such as musical instruments, teaching materials, and equipment. This study relied mainly on bibliographic, historical, and contextual data and analytical methods in approach and analysis. It also made use of interviews, observation, and participant observation methods.

3. Findings and Discussion

The music program in Nigeria's school setting must feature music as a core- subject in its curriculum. Understandably there are two schools of thought as far as music curriculum type is concerned. While the first advocates for core music as a subject the other insists on the Cultural and Creative Curriculum (CCA) (a combination of music, drama, dance, and fine art).

In conformity with Vidal's pragmatism, music educators must be trained practically to meet the necessary challenges that UBE philosophy poses. Each teacher should improve him/herself on his or her practice areas of specialization, to be functionally relevant. This may require registering for short-term practical music training in private music schools.

For Music Education in Nigeria to improve in standard and output, it should be given a solid foundation at the Nursery/Primary school level. In addition, for music to be well entrenched in the so-called UBE program, the Music Education philosophy should be transformative in conceptualization and practice. In this direction, Music Teacher Education should be revolutionized

and recontextualized to meet the 21st-century challenge.

3.1 Overview of Music Education in Nigerian Secondary Schools

In the new National Policy on Education (2014), secondary school education is given in two stages: Junior secondary school (JSS) and Senior secondary school (SSS). At both levels, the curriculum accommodates music as a subject. However, the curriculum subjects are grouped into core- subjects (compulsory), prevocational electives, and non-prevocational electives. Table 1 contains the subject groups for the Junior secondary school. Each student is expected to offer a minimum of 10 and a maximum of 13 subjects, inclusive of all the core- subjects and at least one subject each from prevocational and non-prevocational groups.

Table 1: Junior Secondary School (JSS) Subject Groups:

CORE- SUBJECTS	PRE-VOCATIONAL ELECTIVES	NON – PREVOCATIONAL ELECTIVES
English	Agriculture	Religious Knowledge
French	Business Studies	Physical and Health Education
Mathematics	Home economics	Fine Arts
One major Nigeria Language other than the Language of the Environment	Local Crafts	Music
Social Studies & Citizenship	Computer Education	Arabic
Introductory Technology		

Source: *National Policy on Education, 2019.*

At the senior secondary school level, the subjects are grouped as shown in Table 2.

Each student is expected to offer seven core- subjects; made up of a minimum of one and a maximum of two subjects from vocational and non-vocational electives. However, one of the electives may be dropped in the last year of senior secondary school.

Table 2: Senior Secondary School (SSS) Subject Groups

CORE- SUBJECTS	VOCATIONAL ELECTIVES	NON–VOCATIONAL ELECTIVES
English	Agriculture	Biology
French	Applied Electricity	Chemistry
Mathematics	Auto Mechanics	Physics
One major Nigeria Language other than the Language of the Environment	Bookkeeping and Accounting	Further Mathematics Integrated Science
One of Biology, Chemistry, Physics, or Integrated Science	Building Construction Commerce	Health Education Physical Education
One of the Literature in English, History, Geography, or Social Science	Computer Education Electronics	History
A vocational subject	Clothing and Textile Food and Nutrition Home Management Metalwork Technical Drawing Woodwork Shorthand Typewriter Fine Arts Music	Geography Social studies Bible knowledge Islamic studies Arabic Government Economic Any Nigerian language

Source: *National Policy on Education, 2019.*

The bias of government educational policies in favour of core science and science-based disciplines is a significant issue that will continue to affect the listing of music as a core- subject in Junior and Senior Secondary schools.

Nigerian Music teachers have continually agitated for better funding of the music program in the school systems by the government and its agencies, as it is now, the attainment of the goals of an effective and sustainable music education program can only be best imagined.

In recent times, the teaching of music in Nigerian schools was incorporated and merged into the CCA program. According to Owolabi (2013), the Nigerian Educational Research and Development Council (NERDC) the body that develops curricula for use at all levels of the educational system in Nigeria published the 9-year basic education curricula for old

students and some newly introduced ones in 2007. The new subjects include Basic Science, Basic Technology, Civic Education, and Cultural and Creative Arts (CCA).

The implementation of this CCA curriculum took off immediately in some schools while some schools are not implementing it yet. It is realized in this new curriculum that the four (4) different areas of study are merged to form a subject called CCA: fine art, music, drama, and craft. These areas are collated into a single subject, expected to be taught as one subject. Unlike what it used to be when teachers handled them as two or three separate subjects. The various topics are expected to be taught by specialists in the various components of the subjects. And the subject (CCA) is to be offered from lower to upper basic education classes. (Pry 1 to J.SS. 3)

The main aim of the Federal Government in introducing the 9-year basic education program is to attain the Millenium Development Goals (MDMDGs) by 2015. National Economic Empowerment and Development Strategies (NEEDs) are also being propagated for poverty eradication, job creation, value reorientation, and wealth generation as well as using education to empower people. Specifically, to map out plans and strategies for impacting Nigerian pupils with the local technologies of making crafts and other social arts within their immediate culture. To create awareness and help children to discover various creative activities that are latent in them. Therefore, there is a need for regular review and renewal of the curriculum to ensure relevance to dynamic human society, culture, and global reforms (The Call for Reformation).

In cross-examination of the section of CCA as a subject in the current curriculum, the music section of the CCA curriculum is not well-taken care of. And the subject (CCA) is to be offered from lower to upper basic education classes. (Pry 1 to JSS. 3).

3.2 The Objectives of Cultural and Creative Arts (CCA)

The aim of the CCA program by the Nigerian government is to:

- Propagate poverty eradication
- Job creation
- Value reorientation
- Wealth generation
- Using education to empower people.

These objectives were designed to impact Nigerian pupils' Local technologies of making crafts and other social arts within their immediate culture. To create awareness and help children to discover various creative activities that are latent in them. Therefore, there is a need for reformation of the CCA program to ensure relevance to dynamic human society, culture, and global reforms.

Now at this junction, a critical look at the new CCA program circulated within the 2008/2009 academic session with immediate implementation, according to our findings, some problematic matters and issues as stated below arise:

- Scarcity music topics
- Fundamental themes of music
- Time-table
- The school administrators
- Instructional materials
- Teachers & or specialists.
- The students
- Textbooks
- CCA Syllabus
- Evaluation.

In considering the aims and objectives of the CCA program in Nigerian schools, it is of good motive and intention to build a better society.

Owolabi (2013), remarked that the curriculum in every society must be a reflection of what the people feel, believe, and do. Yet, it must be seen as a deliberate, systematic, and planned attempt not only to change the behaviours of children and youth but also to enable them to gain the social insight and power to build a better society.

Implementation could make any curriculum to be faulty, more so, if not well monitored. In her study, the following were recommended for good implementation of the CCA Program:

- The teacher (Implementor)
- Training of teachers
- Need for more music teachers.
- Standard scheme of work
- Standard textbook
- Music laboratories and art studio.

Sowande (1967: 262) as quoted by Adeogun outlined the broad aims of Nigerian school music education as follows:

- inculcate a genuine love for and conscious pride in one's cultural heritage.
- develop music literacy.
- develop a standard of music criticism based on the content and form to be found in Nigerian traditional music.
- develop the capacity for an intelligent, critical appreciation of music in general.

- develop a consciousness of the similarities and differences between African and Europe musical and poetic structures and examine how far the European structures can be used with the advantage for African music.
- develop a genuine love for good art, regardless of its origin.
- explore music as an art, with the specific aim of satisfying the spiritual, emotional, and aesthetic needs of the individual, primarily as a Nigerian.
- encourage human relationships through corporate activities, such as drumming, dancing, singing groups or friendly competitive events.

All the above aims of music education cannot be achieved unless there are enough professionally trained, efficient, committed, and effective teachers. It is necessary to lay much emphasis on the training of music education teachers, products of which will be responsible for the implementation of the aims and objectives of music education programs in the Pre-primary, Primary, Secondary, and Tertiary Institutions in Nigeria.

With the introduction of Western education in the 19th century, Nigeria's music education has gradually witnessed a progressive change from an informal system of education. For this type of formal music education to take place, the teacher's role is very crucial. It is what he teaches that the learners learn. Music instructors should be informed of the purpose of including music in the school curriculum to provide an opportunity for each child to participate and grow in all aspects of music singing, instrumental, rhythmic, listening, and creative. He must provide experiences, which are truly musical and maintain the integrity of the music.

3.3 The Dilemma of UBE Programme to Music Education in Nigeria

Music education has been highlighted as seen in Nigerian schools. How well have the UBE curricula incorporated music education? There are music curricula designed for the different tiers of Nigeria's educational system. The Nursery/Primary school, the Junior Secondary School, the Senior Secondary School, and the Tertiary Institutions (College of Education, Polytechnics / Monotechnics, and Universities). How have the curricula fared?

Olorunsogo (2006) noted that the Nursery/Primary schools curricula identify creative arts. There is no specific program consciously designed for music education. The content merely refers to songs. This leaves the teacher to do what he/she recognizes as songs. Bearing in mind that it is at this stage that we lay the foundation of music education in children in Nigerian schools. Quite a several private schools are making attempts to incorporate music into their school programs. Music teachers often have to devise their syllabus based on exposure and competence. The writer's interaction with some music teachers involved at this level reveals that there is no set focus and thus no conformity in the available samples interviewed. The interviewees' revelation shows that basic rudiment samples are what they teach along with songs that consist of European nursery rhymes and songs arbitrarily selected from wherever.

In the classroom, what is taught is not CCA. Teachers of Music, Fine Art, and Drama merely concentrate on their subjects. This is to say that the Fine Arts teacher takes the Fine arts aspect and teaches. Similarly, the music teachers take the music aspect and adapt it to class use. Does the Junior Secondary School (JSS) operate Drama in its syllabus? No!

The truth of the matter is that CCA is expected to continue the Creative Art concepts of the Nursery & Primary education level at the JSS. The three aspects of Art are meant to be taught as one subject as Social Studies combines History. Geography and Government or Integrated Science combines Physics, Chemistry, and Biology in class delivery.

4. Results of Findings

Largely this state of music education in the lower level of Nigeria's educational system has greatly affected the effective teaching of music at the 6:3:3 level (Senior Secondary School) of Nigeria's educational system which is the focus of this study. This situation needs a review (reformation) because the Federal Government had launched the Universal Basic Education (UBE) meant for the first nine years of Nigeria's children's education.

At the Senior Secondary School (SSS) the curriculum for music education is so ambitious that one is forced to ask questions as to which category of Nigerians are expected to use the curriculum. Are they Nigerian children who are trained in Europe or those who have not been well-groomed at the JSS? Yet the West African Examination Council (WAEC) and National Examination Council (NECO) set questions as bodies that do not experience reality on the ground. This clearly explains why only a few candidates sit for music at the Schools Certificate level. This is revealed in the selected schools for this study in Ibadan Municipality. Very few interested students offer music at the Senior Secondary School (because music is no

longer compulsory) and drop music to offer a Fine Arts subject. This leads to the low enrolment of Senior Secondary school music candidates in the West African Examination Council (WAEC) and the National Examination Council (NECO), examinations. The implication of this is that the introduction of CCA into the curriculum of Nigerian secondary schools acts as a TOTAL CLOSE DOOR to the teaching of music at Senior Secondary schools and crippled music education in the Nigerian educational system. In addition, the results of this greatly affect music candidates' enrolment and admission process into Nigerian Tertiary Institutions.

The implementation of CCA brought about confusion in most schools. School proprietors were unwilling to employ drama teachers. Music teachers were often assigned to teach music, drama, and dance. Music teachers did not know how to go about teaching drama and the problem of music education was aggravated. Investigation revealed that in several schools in Oyo State, the music examination for the Federal Basic Education Certificate Examination BECE (JSCE), (for JSS3) was not written. Fine art examination was written in all secondary schools in place of music subject.

Music education in Nigerian senior secondary schools has been relegated to the background while more attention was given to Fine Arts as observed in the selected schools for this study in Oyo State. Cultural and Creative Arts (CCA), Basic Education Certificate Examination (BECE) for (JSS) students had just nine (9) music objective questions, out of sixty (60) objective questions. The Cultural and Creative Arts curriculum has not been drafted to accommodate effective music teaching in secondary schools and it has made music irrelevant and unrelated to the Nigerian educational system at the JSS and SSS levels of education.

Empirical evidence from the selected schools used for this study revealed that Senior Secondary schools (SSS) no longer turn out students with high potential of music for further study in music in Tertiary Institutions in Nigeria, and some secondary schools in Nigeria do not offer music as a subject at all. Some music teachers lack practical knowledge of musical instruments of both Western and traditional as contained in the music curriculum of the Senior Secondary Schools (SSS) in Nigeria.

5. The Implication of CCA on Music Education

The implication of CCA in Secondary Schools that calls for reformation is well described in the work of Oladapo (2013), that the aim of music in the Cultural and Creative Arts (CCA) is to enhance other arts. Music being a cultural subject will bring about the effective teaching of other arts such as drama, fine arts, craft, and dance, to help the upcoming generation fit into society, but rather the reverse is the case, music in Nigerian secondary schools has been relegated to the background and rendered redundant.

It has been reduced to end-of-the-year entertainment in schools. Some proprietors of schools and stakeholders in education feel that music education is no more relevant in secondary schools and just anybody that is not in the field of music can teach music in the Cultural and Creative Arts curriculum, and there is nothing special in teaching the content such as "the role of music in the society" and so on. There are cases of three private secondary schools in Oyo state where the teachers of music were sacked, the proprietors felt that their services were no longer needed.

The Ways Out and the Reformation Call on the State of Music Education in Nigerian Secondary Schools.
The music teacher of a secondary school who should be a graduate of music has many roles to make the aims and objectives of music education in secondary schools a reality. Teachers teaching must understand that teaching phenomena vary from time to time, therefore, the method of teaching (pedagogy) and styles must be varied to suit a set of students or at any particular time.

The teacher of music must be well informed about the curriculum of music. The CCA is directed toward individual, social and cultural learning and development. The music teacher must Cooperate with the teacher of Fine arts to teach students the use of experimental methods in solving problems in changing world.

Methodology contributes greatly to the interest and positive development of students. It has been observed that students' poor performance and lack of interest in music could partly be due to poor teaching methods. The teacher of music must know the subject and must be able to deliver the subject effectively.

The process of implementation must not be static, because changes take place in educational programs

daily. The teacher of music must go for innovations in the field of music to be more effective.

6. Conclusion

The development of music education in Nigerian Senior Secondary schools is dependent upon functional music programs which are still absent. The realization of an ideal music program in schools is dependent upon a redefined and transformative Music Education as a philosophical goal.
Music teachers should work against all sorts of vices and challenges that make teaching music in schools incapacitated. Contemporary music education in Nigeria has to be transformative to be relevant to the immediate societies.

For the philosophy of the Nigerian educational system most especially in the Senior Secondary Schools to be in harmony with the country's national objectives, it has to be geared towards self-realization, better human relationships, individual and national efficiency, effective citizenship, national consciousness, and national unity, as well as towards social, cultural, economic, political, scientific, and technological progress.
The study suggests the indispensability of transformation and the enforcement of music as a core – subject in the school program. It also calls for proper teaching and learning of music. Also, the government should be pressed down by relevant bodies such as SOMEN, ANIM, etc to make adequate reformation on the current state of music in Nigerian senior secondary schools to forestall possible loss of jobs for music teachers in Nigerian secondary schools.

7. Recommendations

Based on the literature and findings of the research study, the following recommendations have been proffered to improve the teaching and learning of music in secondary schools in Nigeria.

To enhance the proper implementation of music education in Nigerian Senior Secondary schools, the government and individuals should do the following:

- State and Federal Governments through the Ministries of Education should employ well-trained music graduates and organize seminars and workshops not only in music aspects but also on the methods of teaching.
- Educational organizations such as MUSON etc. should do the same to improve the quality of music teachers. The calibre of teachers who can understand the contents of music as a discipline and art and the principles of music education are teachers who hold certificates in music ranging from NCE, B.A, and M.A in music education. Their knowledge of music and performance skills are far superior to other subject teachers.
- Government should organize workshops and seminars to work out an acceptable curriculum for the teaching of music in secondary schools.
- Short-term courses, weekend seminars, conferences in-service training, vacation and refresh courses focused on methods of teaching should be organized by Universities and the Advanced College of Education to update music teachers' knowledge.
- Ministry of Education should draw up and control the curriculum of music in senior secondary schools.
- Government should organize corporate bodies, firms or organizations to monitor the standard of methods and techniques of music teaching in secondary schools.
- Government should give financial support by way of grants for equipment or facilities.
- Universities experts should be encouraged by the government to conduct research in the areas of methods of teaching music to effect necessary changes in the teaching of music in the private/public sector.
- The content of the curriculum for senior secondary school should incorporate more aspects of African music covering vocal and instrumental repertory structured form. History as well as the biographical study of African musicians.
- Government should provide good learning environments (facilities). Because of the nature of music as a subject, a music room setting is recommended for the methods of teaching. A music room approach for teaching music is a system that accommodates project activities, practical activities, theory activities, and practising and experimental experiences.
- Textbooks used in the teaching of music should be relevant to the experience and the background of the students.
- Sophisticated aspects of Western music should be learned to improve on Nigerian music because the present curriculum is too foreign in orientation to the students understanding. The history and literature of African music should be studied. There is no need to study Western history and the literature of music. The philosophy and

content of our literary music education must drive by our African resources and realistic experiences is worthy of note.

- Local instructors should be invited to our schools to teach how to play, repair and make traditional musical instruments.
- Necessary research must be conducted on the methods of teaching music. Audio-visual and bibliography materials were developed and produced. And the present curriculum revised to remove defects and to meet the educational and cultural challenges of a constantly changing Nigeria. Politically, socially, economically and historically. The next few years should see an intensive re-awakening of methods of teaching music in Nigeria Senior Secondary Schools.
- Government at all levels (federal, state, and local government) should be more involved in the advancement of music education by building more infrastructures that would help to improve the subject.
- An empowerment programme should be organized for music teachers so that they may be able to advance their teaching skills and competence
- Music educationists should join lawmakers of the country so they can advocate for the study
- Music associations should create an avenue where the status of music education in the country can be constantly reviewed and improved without the intervention of the government
- Private organizations should be encouraged to give sponsorship to senior secondary schools regarding infrastructures, music scholarships e.t.c
- Music alumni should make it a priority to improve the standard of music education in the country.
- More music associations should be formed at every local government of the state to address pressing issues and rebuild the standard of music education
- Researchers should continue to highlight more problems faced by music education to enable policymakers and stakeholders in the music industry to address the issues accordingly.
- Considering the poor economy of the country and less attention from the government, music teacher's associations in senior secondary schools should make sacrifices to raise funds through concerts or other activities to enhance the effective study of the subject.

To Stake Holders:

- For music education to improve in Nigeria, lovers of music highly respected men and women of our society and admirer of education should come together and support music education in the senior secondary to encourage the forerunner of the arts to move the country forward.
- Parents' teachers' association forums should also be more active in the developmental process of music education in schools.

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Nigeria Social Studies Teachers' Perceived Competence and Impact of Environmental Education

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Abstract. This study investigated teachers' areas of competence and perceived impact of Environmental Education (EE) in Nigeria. A structured questionnaire was administered on four hundred and eleven (411) teachers from thirty selected secondary schools' teachers selected across five local government areas in Ogun State, Nigeria were administered with a structured questionnaire. The results showed that teachers were not competent in the five areas of competency examined and were not well prepared for teaching Environmental Education (EE) during their training. Furthermore, majority of teachers believed that EE would impact positively on the students. Nevertheless, teachers' competence and perceived impact of EE did not significantly differ based on gender or the class taught. However, teachers of senior and junior classes had very different perceptions of the impact of EE. ANOVA test showed that significant difference was found in teachers' area of competence and perceived impact of EE based on their school location, and education qualifications. The results also revealed weak relationship between area of competence and perceived impact of EE.

Keywords: Social studies, Competence, impact, environmental education, Nigeria

1. Background to the Study

One of the key recommendations of the first human environment conference held in in Stockholm, Sweden in 1972, was the call to countries to implement a programme of environmental education (EE) at formal and non-formal education sectors. As a follow-up, several conferences were organized, these include: the Belgrade, 1975 UNESCO Conference on Environmental Education, Tbilisi, Georgia Intergovernmental Conference in 1977, and UNESCO- UNEP Congress in 1987.

The outcome of the 1977 Conference in Georgia, a former USSR State, was the "Tbilisi Declaration". It defined at EE as "a learning process that increases people's knowledge and awareness of the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivation and commitments to make informed decisions and take responsible action" (UNESCO, 1998).

Prior to the definition in the Tiblisi Declaration, the UNESCO-UNEP (1978) explain that EE is to "develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones. Since, the Tiblisi Declaration definition of E E, scholars have come up with different definitions of the discipline to further drive home, the intention and ultimate goal of Environmental Education. Among these scholars are: Erhabor and Don (2016) who describe E E as a process of incorporating environmental content in the curriculum at all levels of education with a view to increase the awareness of the learners on environmental issues. Furthermore, Olatunde-Ayedun (2020) describes E E, particularly in

this 21st century as organised activities geared toward teaching about how natural environments function, how people can better manage their behaviours while relating with their natural environment in a sustainable manner. Drawing from these definitions, EE can be described as a form of education that aims at creating awareness and developing attitudes and inculcating skills in individuals which will help people resolve environmental issues in their communities. EE is therefore, critical for the development of a sustainable environment.

A synthesis of these definitions will reveal a major fact, about the nature of E E. This is that EE is a discipline that focused on both human and nature, it is multi-faceted, and aimed at achieving the following goals:

- Foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
- Provide every person with opportunities to acquire the knowledge, values, attitudes commitment and skills needed to protect and improve the environment; and
- Create new patterns of behaviour of individuals, groups and society as a whole towards the environm4ent (UNESCO-UNEP, 1978).

The goals, along with their associated objectives and principles, have influenced much of what has been achieved in the name of EE around the world today. Many countries, particularly developed countries like Nigeria, began EE programme in the 1970s, and these have evolved over the decades.

Countries world over including Nigeria have realized that teachers are important factor/agent in education process. In its National Policy on Education FGN (2013:30) it is explicitly stated that "no education system may rise above the quality of its teachers". This implies that teachers are expected to display high level of competence. Some scholars (Kim et al.,2019; González-Fernández, et al 2024; Ruiz-Cabezas et al, 2020; Vitello et al 2021) view "competence" as a state or quality of being adequately qualified and capable of performing a given task or responsibility. It is a concept that encompasses knowledge, attitude, and skills that a person possesses and use to better and improve performance of his/her tasks. Thus, teacher's competence can be explained as the overall ability of teachers in carrying out their profession, including inculcating students with knowledge and skills through various competencies such as pedagogical, personal, social, and professional competencies. These competencies enable teachers to effectively during the teaching-learning process achieve their behavioural objectives in the classroom (Annan, 2020; González-Fernández, et al 2024; Kim et al.,2019).

In Nigeria, it took a national environmental catastrophe before E E was introduced in the 1990s. Since that time, environmental educators have worked to build EE not as a discipline but rather as a programme that can be included into and taught in schools from primary through secondary levels.

According to Nigerian Education Research Development Council (NERDC, 1992) the goal of EE is to "help students become environmentally aware, knowledgeable, skilled, and dedicated citizens who are committed to work individually and collectively, to defend, improve, and sustain the quality of the environment on behalf of present and future generations of all living things" . With the intervention of NERDC, EE became popular in Nigeria and EE themes were then infused into school subjects at the basic and post-basic education levels (Lawal, 2019). Later development saw the introduction of EE at the tertiary education level, with undergraduate and postgraduate degree programmes introduced into the Nigerian University System.

Nigerian EE is interdisciplinary, and problem-solving approach. It is taught through school subjects: the natural sciences: Chemistry, Biology, Physic, and Integrated Science and Social sciences: Social studies, Geography, Economics subjects. The adoption of this approach to the teaching and integration of EE is based on the understanding that interesting insights and approaches to solving typical environmental issues such as ecological foundation, human environment interaction, impact of environmental change, and sustainable development can be derived from different disciplines (Ogunyemi, 1994; Adara, 1996).

Since the 1970s, research in the field of EE has progressed significantly with most of the studies predominantly focusing on investigating the relationship between knowledge, attitudes, behaviours' and practices (Bonnet, 2013; Skott, 2015). In spite of the critical role of teachers' in educating students', research into teachers' level of competence of EE as well as the influence of teachers' characteristics in the implementation of EE curriculum has been extremely limited in literature. Among the few available are (Dada, Eames, Calder, 2016; Ogar et al. 2020) study of impact of environmental education on preservice teachers' environmental literacy, their preparedness, perception and practices in New Zealand. It adopted a pre-test-post-test design of a mixed-methods approach. The study reported that a

slight shift in the preservice teachers' environmental literacy. Significant relationship between environmental knowledge and dispositions were observed after been exposed to some EE courses. Burns and Bell (2011) study indicated a relatively low level of environmental competence among teachers. Kingsley (2021) study in Cross River State reported that teacher's culture significantly related the teaching of EE; and no significant difference between male and female teachers teaching of EE. Fasiku (2021) study indicated that teachers of Social Studies displayed a more positive attitude to the teaching of EE than non-Social Studies teachers.

Studies on EE in Nigeria have generally focused on determining students' understanding of environmental issues (Agbori, 2016), some focused-on teachers view or perception about infusing EE into school curriculum (Jekayinfa & Yusuf, 2008). Many others try to clarify pre-service teachers and undergraduates' level of awareness and attitudes about environmental issues (Akomolafe, 2011; Egbonyi, & Onnoghen 2016; Omoogun, Onoghen & Ateb, 2014; Ogunyemi & Ifegbesan, 2011; Ogunjinmi, & Oniya, 2016). Others examine the teaching and learning methods for effective EE applications (Ogunbiyi & Ajiboye, 2009). There is no study that has examined teachers' competence and perception of the impact of EE. It is this gap in literature that this study intended to fill. Thus, to empirically conduct this study, the following research questions were raised:

- What areas of Environmental Education do the teachers have competence in?
- What are teachers' perceived impacts of Environmental Education?
- Will there be any significant difference in teachers' competence and perception of impacts of EE based on their background characteristics?
- Is there any significant relationship between teachers' background variables and their competence and perception of impact of EE?

2. Research Methodology

The study's sample were selected from secondary school teachers in Ogun East Senatorial District of Ogun State. Out of the 84 schools in the five local government areas (Ijebu-Ode, Odogbolu, Remo-North, Ikenne, Sagamu and Ijebu-North) that were selected, thirty secondary schools were randomly selected from each of the local government area. A total of 450 teachers with fifteen teachers selected from each secondary school were administered with the questionnaire. However, 411 teachers (i.e. 91.3% return rate) correctly completed the questionnaires and these were used for the analysis.

A close-ended questionnaire was employed as the data collection tool for this quantitative investigation. The questionnaire created for this study was divided into three sections: section A included nine questions about background information, section B had five questions about EE competency, and section C had twelve questions about how people felt about EE, that is its impact. Responses were measured on a 5-point scale that ranged from "strongly agree" to "strongly disagree". The Cronbach alpha for this instrument was 0.76 after pre-test of test-retest was conducted.

The Statistical Package for Social Sciences (SPSS) version 23 was used to analyse the data collected. Simple percentage, Mean and Standard Deviation were employed to respond to the first two research questions. The t-test, ANOVA, and Pearson Product Moment Correlation were used to address the third and fourth research questions.

A four-point Likert "very competence", "adequate competence', "Not competent" and "don't know" and a five-point scale of "Strongly agree", "Agree", "Undecided", "Disagree", and "Strongly disagree". Nominal values were assigned to each of the scale. In order to classify the teachers' perceived impact of EE from the responses the following cut-off ranges were established: positive disposition = Mean score from 3.00 to 5.00; neutral disposition = Mean scores from 2.00 to 2.99 and negative attitude = Mean scores from 1.00 to 1.99. A standard greater than 1.00 was taken to be indicative of high variability among responses.

3. Results and Discussions

According to respondents' demographics, there were 56.4% female and 43.6% male. The respondents' ages ranged from 18 to 37 years old, with a mean of 30 years. As for the education level, 10.5% of the respondents had Nigeria Certificate of Education (NCE), 9.0% were Polytechnic graduates with OND; 25.3% were first degree holders without education and 36.5% were degree holders with education bias. Forty-seven percent of the teachers teach the senior secondary classes while 53 percent teach the junior secondary classes.

When asked if they had received any pre-service or in-service training to teach Environmental Education, 31.1% of the respondents said Yes, 50.0% said No while 18.2% not sure. Of the 31.1 percent respondents who responded in the affirmative, only 20.9% rated their preparation as very adequate, 14.4% perceived it

as adequate and 64.7% rated it as not adequate (Table 1).

Table 1: Teachers' preparation of EE

	Yes	No	Not Sure
Do you have any prior knowledge or experience teaching environmental education?	128 (31.1)	208 (50.0)	75 (18.2)
	Very Adequate	Adequately	Not adequate
If Yes, how well did the course prepare you for teaching environmental education	86 (20.9)	88 (14.4)	260 (64.7)
	Yes	No	Not sure
Do you teach environmental concepts/issues in your lesson?	92 (22.4)	251 (61.1)	68 (16.5)

This result shows that during their training, teachers are not well prepared to teach EE. Perhaps, this accounted for the nature of the response given to the question on whether teachers teach environmental concepts/issues in their lesson. Almost two-third (251; 61.1%) of the teachers responded in the negative "No", while only (92; 22.4%) answer "Yes", and (68; 16.5%) "Not sure". Another factor that could be responsible is the level of curriculum content enrichment used for the teachers while being prepared to become trained teachers, which incidentally is low in EE content.

Table 2 presents the results of the teachers' areas of EE. Results indicated that teachers are generally not competent in the five aspects of competence measured. As Table 2 shows, only 12.2 % of the teachers claimed to be very competent, 17% adequate competent in environmental knowledge and concepts, while 43.3% said they are not competent and 27% cannot say if they are competent or not. On environmental attitudes and values, 14.6 % and 16.1% respectively has very competence and adequate competence in developing environmental attitudes/values while over half of the respondents' i.e., 52.1% do not possess the competence.

Table 2: Teachers' Area of Competence

	Very competent	Adequate competent	Not competent	Don't know	Mean	SD
Environmental knowledge/concepts	50 (12.2)	70 (17.0)	178 (43.3)	113 (27.5)	2.14	0.54
Environmental attitudes/values	60 (14.6)	66 (16.1)	214 (52.1)	70 (17.0)	2.27	0.56
Teaching skills of environmental/ investigation	68 (16.5)	51 (12.4)	174 (42.3)	118 (28.7)	2.16	0.54
Influencing student's environmental behaviour	57 (13.9)	43 (10.5)	200 (48.7)	111 (27.0)	2.11	0.53
Responsible environmental behaviour	85 (20.7)	68 (16.5)	183 (44.5)	75 (18.2)	2.39	0.59
Total	320 (15.6)	298 (14.5)	949 (46.2)	487 (23.7)	2.11	0.55

Just 16.5% of the teachers claimed to be "very competent" in teaching skills of environment and investigation, 28.7% said they were "adequately competent". However, 42.3% reported that they were not competent, while 11.7% said "don't know". In terms of influencing students' environmental behaviour, 27.0% and 10.5% respectively were "very competent" and "adequately competent". Almost half 48.7% were not competent. Less than a quarter 20.7% are very competent and 16.5% adequate competent were competent in responsible environmental behaviour. But 44.5% and 17.0% not competent or don't know.

These could not but be expected because, even with the background of some of the teachers regarding their areas of specialization, the content areas of EE and the pedagogies for delivering such demand some skills and capacity building which the teachers were not exposed to during their pre-service training.

Table 3 displays the teachers' perceived of impact of environmental education. The majority of respondents believed that EE will impact positively on the students. The analysis of the survey items found that the overall mean score for all items was 3.76 which suggests that the teachers have a perception of the possible positive impact of EE.

Table 3: Teachers' Perceived impact of Environmental Education

	Perceived impact of EE	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	Mean	SD
1	Increase interest in environmental issues	55 (13.3)	53 (12.9)	33 (8.0)	202 (49.1)	68 (16.5)	3.40	1.32
2	Improve quality of life	18 (4.4)	63 (15.3)	62 (15.1)	165 (40.1)	103 (25.1)	3.60	1.17
3	Clean and healthy school environment	8 (1.9)	49 (11.9)	68 (16.6)	142 (34.5)	144 (35.0)	3.87	1.10
4	Change in attitudes towards environment	11 (2.7)	52 (12.7)	55 (13.4)	178 (43.3)	115 (28.0)	3.81	1.07
5	Reduction in waste generation	3 (0.7)	45 (11.0)	87 (21.2)	178 (43.3)	98 (23.8)	3.77	.98
6	Improved waste management strategies	11 (2.7)	38 (9.3)	104 (25.3)	175 (42.6)	83 (20.2)	3.67	1.01
7	Increase involvement in environmental activities	13 (3.2)	38 (9.2)	89 (21.7)	175 (42.6)	96 (23.4)	3.73	1.03
8	Greater understanding of the interrelationship between human and environment	11 (2.7)	41 (10.0)	69 (16.8)	142 (34.5)	148 (36.0)	3.90	1.10
9	Behave in an environment responsible manner	14 (3.4)	52 (12.7)	72 (17.2)	150 (36.5)	123 (29.9)	3.75	1.14
10	Develop appreciation of the natural environment	7 (1.7)	39 (9.5)	91 (22.1)	183 (44.5)	91 (22.1)	3.75	.97
11	Knowledge of some basic environmental concepts	12 (3.0)	30 (7.3)	56 (13.6)	188 (45.7)	125 (30.4)	3.92	1.03
12	Wanting to take action to improve the environment	17 (5.6)	38 (9.2)	43 (10.5)	197 (47.9)	116 (28.2)	3.86	1.07
	Total	180 (3.6)	538 (10.9)	829 (16.8)	2075 (42.1)	1310 (26.6)	3.76	0.80

All twelve items exhibited high mean scores above 3.00 with the mid- point suggesting that teachers were positively disposed to the positive impact of EE. More than 68.7% of them agreed or strongly agreed that EE impact on the students while 14.5% of respondents disagreed and strongly disagreed.

An-item-by-item analysis revealed that over two-thirds of the respondents (65.5%) agreed that EE "*increase interest in environmental issues",* whilst an equally large number (65.1%) of the teachers agreed that EE "*improves quality of life".*

Furthermore, about 69.5% of the respondents suggested that *"EE impacts on "clean and healthy school environment"*. Also, more than two-thirds of the respondents (77.2%) were agreed that "reduction in waste generation". The majority (62.8%) said they agreed that *"EE "can improve waste management strategies"*. Seventy percent of the respondents agreed with statements that "*greater understanding of the interrelationship between human and environment",* while (66.4%) agreed with the statement that *"EE would make students to behave in an environment responsible manner"*. Sixty-six percent (66%) of the teachers agreed that *"EE impact would lead to "develop appreciation of the natural environment".* An equally higher percent (76.1%) agreed that "*Environmental Education will impact on the knowledge of some basic environmental concepts"* and *"wanting to take action to improve the environment'.*

Further analyses in respect of independent variables of the study revealed the findings, which are summarized in Tables 4 & 5. An independent t-test analysis revealed that male and female teachers' competence and perceived impact of EE, is not significantly difference between them. (see Table 4).

Table 4: Test of significant difference between teachers' sex and perceived competence/impact of EE

	Sex	N	Mean	Std. D	t	Sig.
Competence	Male	179	13.39	2.97	.592	.554
	Female	232	13.17	4.33		
Perceived Impact of EE	Male	179	45.04	9.73	-.149	.882
	Female	232	45.18	9.48		

The One-way ANOVA test showed that there were significant difference in teachers' competence and perceived impact of EE based on their school location, and educational qualifications.

Table 5: Test of significant difference

School Location		Sum of Squares	df	Mean Square	F	Sig.
Competence	Between Groups	93.235	2	46.618	3.260	.039
	Within Groups	5833.787	408	14.298		
	Total	5927.022	410			
Perceived Impact of EE	Between Groups	396.671	2	198.335	2.172	.115
	Within Groups	37264.487	408	91.335		
	Total	37661.158	410			
Education qualification						
Competence	Between Groups	475.636	5	95.127	7.067	.000
	Within Groups	5451.386	405	13.460		
	Total	5927.022	410			
Perceived Impact of EE	Between Groups	6697.639	5	1339.528	17.521	.000
	Within Groups	30963.519	405	76.453		
	Total	37661.158	410			

Scheffe post-hoc analysis was used to determine the group where the significant difference was found: differences existed between competence mean score for teachers in semi-urban schools (M= 13.68) and was significantly different from teachers from rural schools (M=12.23).

Post-hoc test for educational background revealed that in competence, significant differences were found among teachers with NCE (M = 13.97) and B.A/B.Sc. (M = 11.55); B.A/BSc. (11.55) and B. A/B.Sc. Ed. (M =13.96); OND (M=12.64) and M.Ed. (M =14.12). While there were significant differences in perceived impact both between and within the group.

The correlations are indicated in Table 6. As Table 6 indicates, competence is clearly related to perceived impact of EE ($r = .273$, $p < 0.01$) although positive and weak. The correlation between some respondents' socio-demographic variables and the two dependent variables of competence and perception of impact of EE were weak and negative. For instance, this was found in subject taught (r = -.209), teaching experience (r = -.193) and subject of specialisation (r = -.141).

Table 6: Correlation between teachers' background characteristics, competence and perceived impact of EE

	1	2	3	4	5	6
1. School Type	1					
2. Sex	.309**	1				
3. School location	.101*	.062	1			
4. Teaching experience	-.015	.040	.112*	1		
5. Competence	.015	-.029	.072	-.127**	1	
6. Perceived impact of EE	.058	.007	.098*	-.193**	.273**	1

**Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

This study sought to ascertain the areas of competence and perceived impact of EE on learning. Teachers are essential to a successful educational system and critical to the implementation of educational programmes in general. Any curriculum's success or failure mostly hinges on how competent the teachers are. The findings suggest that majority of the secondary school teachers are not exposed to and inadequately prepared to teach EE. They lack competence in the five areas of EE competence identified in the study. This finding corroborates previous research (Ajayi, 2015; Banerjee, et al 2014; Kuo-Shu et al., 2017), that have shown that teachers are not adequately prepared to teach EE. They are not just deficient in EE content but also in its pedagogy or method of teaching. Low (2014) also reported that a

teacher is only as competent as his/her job allows him/her to be.
This could be further confirmed by the findings of a study conducted by Banerjee, et al (2015), which revealed that that students do differ significantly in achievement in Life Science subjects due to teaching by high or low competent teachers and due to high or low effectiveness of teachers. They equally established a positive relationship between the teacher's competence and teaching effectiveness.

Findings also suggest that the majority of respondents believed that EE would impact positively on the students. The analysis of the survey items found that the overall mean score for all items was 3.76 indicating that teachers possess positive impact of EE. This result found support in Kuo-Shu et al (2017) study which reported that EE had a significant perceived impact on student learning and teaching process. It also showed that EE had the most impact on students' enthusiasm, motivation, and attitudes towards learning. Findings from Yesilyurt et al. (2020) study also lend a great credence to this result. According to the findings of the research, students who received Environmental Education, draw pictures enthusiastically and reflecting environmental awareness, also after interviews students gain awareness towards the environment, and empathised with nature.

There was, however, no significant difference existed between teachers' competence and impacts of EE by gender as well as class taught. There are statistically significant differences at $p<.05$ in the means of the teacher's areas of competencies and perceived impacts of EE according to their subject taught, subject of specialisation and educational background. Although, all the teachers, regardless of their demographic background, have attended the same teacher education preparation programme approved by the Federal Ministry of Education, teachers still showed difference in competencies and perceived impacts of EE.

Findings revealed that teachers' competence of EE is related to their perceived impact of EE. This is in line with the study of Chikati, and Okendo, (2018) reported a positive correlation between environmental literacy variable and responsible environmental behaviour. Some of the teachers' demographic variables showed either positive or negative correlation with their competence and/or perceived impact of EE.

4. Conclusion and Recommendations

This study was conducted to assess teachers' competence in EE. The results of the study indicated that the great majority of secondary school teachers lacked competence in all five EE domains. The majority of secondary school teachers had positive opinions on the impact of EE. Additionally, there were no significant gender differences in competence and perceived impacts of EE. However, there were significant differences in competence and perceived impact of EE according to the subject taught, the area of specialisation, and the educational qualification.

The findings led to certain recommendations that will not only strengthen the instructors' current competencies but also improve the school EE programme in Ogun State and Nigeria. In 21ecognizing the importance of teacher professional development, there is a need for review of the current teacher education programme with a view to making EE become an integral part of the teacher education programme in the various teacher training institutions. The government should provide opportunities for periodic in-service training on EE to teachers. Support structures to facilitate the implementation of EE must be put in place. Also, there is need to develop a structured syllabus or learning concepts on EE which will be made available to all teachers in order to help them get familiar with what to teach and incorporate them into their lesson.

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Investigating Prevalence of Risk Factors of Hepatitis 'B' Among Staff and Students of Public Tertiary Institutions in Nigeria: Implication for Health Security in Education.

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Abstract. Just as academic staff of any tertiary institution are employed to enhance learning through instructions and other services that promotes institutional mission, so also, students are admitted in school to acquire knowledge, and to be given the best possible chances of achieving good and quality education but not to return home with a transmissible disease like Hepatitis 'B' Virus (HBV). The purpose of this study was to investigate the prevalence of risk factors of HBV among academic staff and students of tertiary institutions along gender lines, as implication for health security to education. A cross-sectional descriptive study was carried out in three selected public tertiary institutions within Niger State. The study adopted 90 academic staff (51 males and 39 females), and 348 students (156 males and 192 females) selected randomly from the three institutions. A self-developed questionnaire titled Questionnaire for Assessment of Prevalence of Risk-Factors of Hepatitis B Virus (SQ-APRF-HBV) for both academic staff and students was used to collect data. Data collected were analyzed using mean, standard deviations, and t-test at 0.05 level of significant difference. The findings of the study revealed that there is statistical significant difference between the male and female academic staff in sexual health and behavior and in blood transfusion related activities. This is evident as results showed 17.00 for sexual health and behavior, and 3.86 in blood transfusion related activities, which are greater than the critical value of 1.990. For sexual health and behavior, sharing of supposed personal items, use of unsterilized items, and blood transfusion related activities among tertiary students showed -3.59, -19.62, -32.62 and 0.89 respectively, all less than the critical value of 1.960. Mandatory HBV test for staff and students, among others were recommended.

Keywords: Hepatitis 'B', Risk Factors, Academic Staff, Students, Tertiary Institutions, Health Security and Transmission

1. Introduction

Hepatitis B is the medical terminology for inflammation of the liver. Its complications are associated with infections such as liver cirrhosis and cancer (Ajuwon, Yujuico, Roper, Richardson, Sheel and Libury, 2021). Hepatitis B is a serious infectious disease caused by a virus that attacks human liver and affects people of all ages around the world. It causes swelling and reddening of liver leading to its damage, and causing serious illness and in some cases, death (Chanda and Mutala, 2021). Ajuwon et'al (2021) further revealed that, "Hepatitis B Virus (HBV) was responsible for an estimated 820,000 deaths in 2019". There are many causes of hepatitis B, including viruses, alcoholism, and medications. However, virus-related infections are the common causes of chronic hepatitis in Africa (Namwinga, 2021).

It is fearful to know that Hepatitis B Virus (HBV) can easily be spread among people, most especially if proper hygiene is not strictly observed and caution to anti-social behavior is not carefully treaded (Chanda and Mutala, 2021). Fasoranti (2021 opined that the main routes of transmission are through sexual contact, sharing of needles, tattooing and body piercing as transmission occurs through blood or other bodily fluids, including semen or vaginal fluids. Douglas and Lukman (2021) stated;" anyone can get hepatitis B, and people at higher risk of becoming infected with the virus are those that have not received hepatitis B vaccine".

Most fearful is the fact that, "most people do not show symptoms when they are newly infected or chronically infected, they can unknowingly spread the virus to others and continue the silent spread of hepatitis B" (Mkandawire, 2022). Risk factor of hepatitis B, therefore, is anything that increases a person's chances of contacting the virus, or developing the disease (Douglas and Lukman, 2021). The more risks any persons are exposed to, the higher the chances of being infected with the disease (Namwinga, 2023). Douglas and Lukman further stated that, "certain lifestyle-factors are linked to HBV infection, hence, avoiding or changing certain behaviors can lower their risk.

In Nigeria, many youths between the ages of 15 to 50 are in various tertiary institutions, either as staff (Academic and non-academic staff) or student. Hence, the collection of these institutions of higher learning translates to higher tendencies of youthful socializations and prevalence of anti-social behaviors capable enough to facilitate rapid spread of the hepatitis B virus. Due to the way that Hepatitis B spreads, people most at risk for getting infected include people who have unprotected sex, people who live in close contact with a person with hepatitis B, people who share personal items such as unsterile needles, razor blades, tooth-brushes, nail clippers, body jewelries, etc. (Hepatitis B Foundation, 2020). Hence, social interactions and some anti-social behavior exhibited among staff and students in tertiary institutions posed as risk factors which exposes them to more likely to be infected, or increases chances of influencing the development of the disease.

According to Namwinga (2023) and Fasoranti (2021), the prevalence of some of the risk factors shielded in many and varied observed anti-social behaviors, like the practice of illicit sexual intercourse commonized among male and female adolescents and adults, drug, substance and alcohol abuse, cultism and fighting, among others are very common, especially, in tertiary institutions of learning, in Nigeria. Similar studies by some authors have come up with some findings; example, Shehu and Ibrahim (2021) reported more female subjects are infected with HBV than their male counterparts, though with no explicit reasons, Namwinga (2023), in a conversed report, opined "the higher male prevalence is likely because adolescent and adult males are prone to engage in risky practices that promote the spread and transmission of the virus.

1.1 Statement of the Problem

The youths in Nigeria accounts for 32% of its 227 million people and more than half of adolescents and adult within the age range of 15 - 40 are sexually active (Isife, 2016), and a common characteristic of young people in Nigeria is their potential vulnerability to sexually transmitted infections including Hepatitis B Virus (HBV). Aside the poor hygiene practices which may likely promote the spread of the virus, prevalence of anti-social behavior, wild practices of dating behavior and violence, sexual harassments and misconducts have been reported among staff and students alike. These vices kept increasing dramatically in the corridors of Nigeria tertiary institutions over the past years. These have health endangering implications as such vices are capable enough to facilitate the spread of HBV. Several studies have addressed issues around prevalence of risk factors of hepatitis B among male and female gender, but no serious attention has been paid to Nigerian Universities and implication for health security in education, especially in Niger State. This investigation is an attempt to fill this knowledge gap.

1.2 Objectives of the Study

- To assess the risk factors of hepatitis 'B' virus among male and female academic staff of tertiary institutions in Niger State.
- To investigate the risk factors of hepatitis B virus among male and female students of tertiary institutions in Niger State.

1.3 Research Questions

- What is the difference in the risk factors of hepatitis B virus between male and female academic staff of tertiary institutions in Niger State?
- What is the difference in the risk factors of hepatitis 'B' virus between male and female students of tertiary institutions in Niger State?

1.4 Hypothesis

- There is no statistical significant difference in the risk factors of hepatitis 'B' virus between male and female academic staff in tertiary institutions in Niger State.
- There is no statistical significant difference in the risk factors of hepatitis 'B' virus between male and

female students in tertiary institutions in Niger State.

1.5 Theoretical Framework

This study employed the Theory of Reasoned Action (TRA) advanced by Martins Fishbein and Icek Ajzen in 1975.
The theory is established on the assumption that individuals' behavior is determined by an intent to launch a particular action which is not devoid of the persons' attitude towards his/her behavior and subjective norms (Nickerson, 2023). Hence, the theory has four main terms: Belief, Attitude, Subjective Norms, and Intention (Hagger, 2019). This suggests that Attitude, Norms and perceived control each lead to intentions - the readiness to exhibit certain behavior (Looti, 2022). However, other scientists have attempted to re-group and explain the background factors that lead to the behavioral, normative, and control beliefs linking to the attitude, subjective norms, and perceived behavioral control, respectively. These environmental factors, according to Nickerson (2023) include Personal Factors (traits, locus control, emotions, and health concerns), Demographic factors (Age, gender, race, ethnicity, education, income, and religion), and Environmental factors (Diagnosis, stress, and media exposure).

By implication to this study, intention among staff and students to indulge into any social and unhealthy practices can be explained partly by their knowledge about the attitude towards the activity. The two fundamental assumptions derived from the theory are that human beings are rational and make systematic use of the information available to them. Secondly, people consider the possible implications of their intended actions before deciding whether to indulge or not in certain behavior. For example, in situations where staff and students are furnished with adequate information about the relationship between some social interactions and anti-social behaviors, such as illicit and unprotected sex common among students and with staff in tertiary institutions and the consequent risk factor of spreading hepatitis 'B' virus, the intention to get involved into such health-threatened activity may be threaded with great caution. If a student knows that the society is at the risk of being infected by the carriers who may not be aware of their health status as it relates to the prevalence of the virus, then, the person is more likely to channel his social interactions and behaviors into activity that will protect him/her from the associated risk of being infected with the virus.

2. Conceptual Issues

2.1 Common Symptoms of Hepatitis B Infection

Generally, the common signs and symptoms of hepatitis B, according to Mendy and Hall (2024) may include; abdominal pains, dark urine, fever, joint pain, loss of appetite, nausea and vomiting, weakness and fatigue, loose stool or diarrhea, yellowing of the skin and jaundice may appear. "In jaundice, the skin and the whites of the eyes take on a yellow tint.

It is important to note that "more than 90% of people who get HBV as adults ultimately recover from the symptoms.
When managed properly, those living with the virus can expect to live a normal life (Mendy and Hall, 2024).

2.2 Risk Factors of Hepatitis B Virus Among Staff and Students of Tertiary Institutions

The risk factors which are common causes and transmittable charnels of spreading the virus to other people can be diverse and contextual. These are as follows:

Sexual Contact:

Hepatitis 'B' Virus (HBV) infection could result from transmission of associated organisms through any genital, anal or oral contact with another person's which may occur during the process of sexual contact (Inoue and Tanaka, 2016). Mojeed (2021), in his article published in Premium Times Newspaper, reported that "some Nigerian university lecturers, especially those in public universities have some time now gained an unsavory reputation as sex predators. Just as Sunday (2023) noted the explosive tendencies of male lecturers taking sexual advantage of young naïve female students in exchange for marks. Hence, those with multiple sexual partners are at higher risk of being infected, especially when having unprotected sexual intercourse with an infected partner (Mendy and Hall, 2024). The virus can spread through body fluids like semen or blood from an infected person to an un-infected person during unprotected sexual process.

Indiscriminate Sharing of Personal Items:

HBV can be transmitted carelessly and unintentionally by sharing of personal items such as razor blades, nail cutter, barbing

clippers, body jewelries, toothbrush, towel handkerchiefs, earrings, earphones etc. (Ilo, Onwunaka, and Nwimo, 2015). It takes only a small amounts and exposure of blood on the items to transmit the virus (Hepatitis B Foundation, 2020).

Use of Unsterilized Items:

The transmission of HBV is also possible by contaminated needles and sharp objects (Inoue and Tanaka, 2016). Egbe, Ike and Egbe (2023) observed, "body piercing, which represents a progressively popular socio-cultural phenomenon, is also a potential exposure approach for the HBV". Tattooing and latest trends in fashions, such as body piercing and explosives make-ups through the use of sharp objects, especially, when the sterility of the objects used are not guaranteed pose high risks of contracting and spreading the virus (Fasoranti, 2021).

Blood Transfusion:

Despite the incidence of a drastic fall in transfusion-associated hepatitis due to improved donor selection, screening criteria and major technological advances in testing for viral hepatitis carriers, tests will never be 100% reliable, and the risk will never be zero (Douglas and Lukman, 2021). Namwinga, advised, however, "it may still be reasonable to consider transfusion of blood as a possible cause and risk factor of HBV".

3. Research Methodology

A cross-sectional study was carried out among 90 and 348 randomly selected academic teaching staff and students respectively, in three selected public tertiary institutions within Niger State. Namely, Niger State College of Education, Minna (C.O.E), Ibrahim Badamasi Babangida University, Lapai (IBBUL), and Federal Polyitechnic Bida (FPB). A self-developed questionnaires titled Questionnaire for Assessment of Prevalence of Risk-Factors of Hepatitis B Virus (SQ-APRF-HBV-AS) was used to collect data on the prevalence of risk-factors of HBV among staff and students of the tertiary institutions. The data was analyzed using descriptive statistics of mean and standard deviation, and inferential statistics of t-test was used to test the hypothesis at the 0.05 level of significance.

There were 90 and 350 questionnaires that were distributed for academic staff and students, respectively, 2 were not returned by the students, leaving 90 from academic staff and 348 from students' valid questionnaires for analysis. The distribution of the sampled population by gender and HBV status are presented in Table 1 below:

Table 1: Distribution of the Sample by Gender and HBV Status

Variables	Count	Males	Females	HBV Status		
				Positive	Negative	Uncertain
Academic Staff	90	51	39	-	82	8
Students	348	156	192	2	254	94

Table 1 above showed that, 51 (56.6%) and 156 (44.8%) of the respondents were male while 39 (43.33%) and 192 (55.2%) were female, for academic staff and students, respectively. A high proportion of the academic staff respondents, 82 (91%) and students' respondents 254 (72.9%) indicated negative on their HBV status, while, 8 (9%) of academic staff and 94 (27%) were uncertain, as 2 (0.6%) of students' respondents indicated positive.

4. Results

Answering Research Questions

The results of this study is presented in tables 2 to 5 below:

Table 2: Descriptive Statistics of Sexual Health and Behavior among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

		Academic Staff				Students			
S/N	Statement	Mean		SD		Mean		SD	
		M	F	M	F	M	F	M	F
1.	I have more than one sex partner	3.10	1.23	0.35	0.54	2.70	2.67	0.18	0.16
2.	I use condom & other protective items during sex	2.61	1.90	0.31	0.41	1.94	2.17	0.20	0.17
3.	I don't have any sex partner	2.00	1.33	0.34	0.52	1.82	1.86	0.21	0.18
	Aggregate	2.57	1.47	0.33	0.49	2.15	2.23	0.20	0.17

Means and standard deviations of responses of academic staff from the outlines of items related to sexual health and behavior as presented in table 2 showed male academic staff are involved more into sexual relationships, hence, they are more at risk of being infected with HBV than their female counterparts. This is proved from the coefficients of total mean responses and standard deviation of 2.57 ± 0.33 for males to 1.47 ± 0.49 of females. The mean and standard deviation of 2.15 ± 0.20 for male students and 2.23 ± 0.17 for female students showed a correlated sexual health and behaviors, suggesting equal risk-factor prevalence.

Table 3: Descriptive Statistics of Sharing of Supposed Personal Items among Male and Female Academic Staff and Students in Tertiary Institution in Niger State.

		Academic Staff				Students			
S/N	Statement	Mean		SD		Mean		SD	
		M	F	M	F	M	F	M	F
4.	I use public barbing clipper/saloon items for my hair up-keep	2.78	3.08	0.32	0.40	3.19	3.73	0.21	0.24
5.	I use personal nail cutter/razor blade to cut nails	3.53	3.79	0.43	0.16	3.49	3.98	0.24	0.27
	Aggregate	3.16	3.44	0.38	0.28	3.34	3.86	0.23	0.26

Table 3 showed the total mean responses and standard deviations of 3.16 ± 0.38 and 3.44 ± 0.28 for male and female academic staff respectively, and 3.34 ± 0.23 for male students and 3.86 ± 0.26 for female students, indicating a slight difference in the risk factor of HBV between male and female academic staff and students, respectively. However, a succinct description is pointed more towards both females having a careless attitude of sharing supposed personal items than their male counterparts.

Table 4: Descriptive Statistics of Use of Unsterilized Items among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

		Academic Staff				Students			
S/N	Statement	Mean		SD		Mean		SD	
		M	F	M	F	M	F	M	F
6.	I have tattoos on my body	1.00	1.00	0.52	0.60	1.17	1.66	0.28	0.20
7.	I have a modern pierced nose, multiple pierced ear/other parts of my body.	1.00	1.34	0.52	0.60	1.17	2.20	0.28	0.17
8.	I have ever been pierced with unsterlised needle/items for other reasons.	1.45	1.49	0.43	0.48	1.90	1.74	0.22	0.20
	Aggregate	1.15	1.28	0.49	0.51	1.41	1.87	0.25	0.19

In table 4 above, there is similar prevalence of risk factors of HBV between male and female academic staff and students, respectively, as shown by the coefficients of mean responses and resultant standard deviations (1.15 ± 0.49 and 1.28 ± 0.51).

Table 5: Descriptive Statistics of Blood Transfusion Related Activities among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

		Academic Staff				Students			
S/N	Statement	Mean		SD		Mean		SD	
		M	F	M	F	M	F	M	F
9.	I have blood transfusion history.	1.12	1.00	0.50	0.60	1.44	1.90	0.08	0.18
10.	I am a blood donor	1.76	1.00	0.38	0.60	1.49	1.00	0.24	0.27
	Aggregate	1.44	1.00	0.44	0.60	1.47	1.45	0.16	0.23

The mean responses of male and female academic staff and students to the outlined items related to blood transfusion shows male academic staff possess higher risk than their female folks (1.44 ± 0.44 and 1.00 ± 0.60), as female academic staff shows non-prevalence. Whereas, there is similar mean responses and standard deviations from male and female students (1.47 ± 0.16 and 1.45 ± 0.23), suggesting equal prevalence of risk factors between and among them.

Testing of Hypothesis

Tables 6, 7, 8 and 9 shows t-test statistics for difference in the prevalence of risk factors of HBV between male and female academic staff, and male and female students.

Table 6: t-test Statistics for Difference in Sexual Health and Behavior among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

	Academic Staff				Students			
	SD	DF	t_{cal}	t_{tab}	SD	DF	t_{cal}	t_{tab}
Male	0.33				0.20			
Female	0.49	88	17.00	1.990	0.17	346	-3.59	1.968

α = 0.05; df = n-2

The t-test statistics at 0.05 significant level with a p-value of 17.00 showed there is statistical significant difference between the male and female academic staff' sexual health and behaviors. This is because the calculated value is greater than the critical value of 1.990. On the other hand, the t-test statistics with a p-value of -3.59, which is less than the critical value of 1.968, showed a contrary result, that, there is no statistically significant difference between male and female students' sexual health and behaviors. Since, the calculated values for academic staff is greater, and that of the students is less than the critical values, the null hypothesis for $H0_1$ and $H0_2$ is rejected and upheld, respectively.

Table 7: t-test Statistics for Difference in Sharing of Supposed Personal Items among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

	Academic Staff				Students			
	SD	DF	t_{cal}	t_{tab}	SD	DF	t_{cal}	t_{tab}
Male	0.38				0.23			
Female	0.28	88	-4.06	1.990	0.26	346	-19.62	1.968

α = 0.05; df = n-2

The t-test statistics at 0.05 significant level with a p-value of -4.06 and -19.62 revealed there is no statistically significant difference between the male and female academic staff, and male and female students in sharing of supposed personal items, respectively. The calculated values for both are less than the critical values of 1.990 and 1.968, respectively. The null hypotheses for both $H0_1$ and $H0_2$ are not rejected.

Table 8: t-test Statistics for Difference in the use of Sterilized Items among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

	Academic Staff				Students			
	SD	DF	t_{cal}	t_{tab}	SD	DF	t_{cal}	t_{tab}
Male	0.49				0.25			
Female	0.51	88	-1.21	1.990	0.19	346	-32.62	1.968

α = 0.05; df = n-2

From t-test statistics at 0.05 significant level and with a p-value of -1.21 and -32.62 showed there is no statistically significant difference between the male and female academic staff, and male and female students in the use of sterilized items, respectively. The calculated values for both are less than the critical values of 1.990 and 1.968, respectively. The null hypotheses for both $H0_1$ and $H0_2$ are upheld.

Table 9: t-test Statistics for Difference in Blood Transfusion Related Activities among Male and Female Academic Staff and Students in Tertiary Institutions in Niger State.

	Academic Staff				Students			
	SD	DF	t_{cal}	t_{tab}	SD	DF	t_{cal}	t_{tab}
Male	0.44				0.16			
Female	0.60	88	3.86	1.990	0.23	346	0.89	1.968

α = 0.05; df = n-2

From the table 9 above, the t-test statistics at 0.05 significant level with a p-value of 3.86 showed there is statistical significant difference between the male and female academic staff in blood transfusion related activities, because the calculated value is greater than the critical value of 1.990. On the other hand, the t-test statistics with a p-value of 0.89, which is less than the critical value of 1.968, showed a contrary result, that, there is no statistically significant difference between male and female students in blood transfusion related activities. Since, the calculated values for academic staff is greater, and that of the students is less than the critical values, the null hypothesis for $H0_1$ and $H0_2$ is rejected and upheld, respectively.

5. Discussion on the findings

The purpose of this study was to investigate the risk factors of HBV among academic staff and students of tertiary institutions in Nigeria with focus on the difference in the prevalence of risk factors of hepatitis 'B' virus between male and female genders, respectively. The results of the findings showed that there is statistical difference in the prevalence of risk factors between the male and female academic staff in tertiary institutions, with Male counterpart more frequently exposed to the risk factors of hepatitis B virus, specifically, through sexual health and behaviors, as well as blood transfusion related activities. This result is in agreement with the findings of Chanda and Mutala (2021), which concluded that Male were more frequently exposed to the risk factors of hepatitis B virus as compared to female folks.

The findings of this study further revealed, there is no significant difference in the risk factors of HBV between the male and female students in tertiary institutions. The result agreed with Abimbola, Odinaka and Nicholas (2016) who observed that, male and female subjects were equally exposed to HBV, and Namwinga (2023) equally agrees that male and females are equally exposed to the risk factors. However, Shehu and Ibrahim (2021) reported that more females than males were seropositive to HBV laboratory test, suggesting, females are exposed more to the risk factors. This is in conflict with the findings of this study.

The risky sexual behavior ranging from casual sex, to having more than one sex partner prevalent among academic staff and students of tertiary institutions remains a major risk factor to possible HBV transmission and infection. With about less than 2% of infected respondents relating in academic and social activities, there is a likelihood of engaging in illicit sex and with multiple partners which is a risk to spreading the virus.

5.1 Implication of the Findings for Health Security to Education

Although, the demographic data in table 1 shows that high proportion of 82% of academic staff of the institutions and 72.9% indicated negative on their HBV status, the respondents of 9% of academic staff and 27% who were uncertain, and those of about 2% of students that indicated positive are however a threat to the health security of not just to the academic staff and students in Nigeria tertiary institutions, but to the entire community of educational institutions and society at large. This is because, some people, according to Mitra et'al (2018) are infected without feeling sick or exhibiting any form of symptom. They can transmit the infection to others. Since most carriers are contagious - meaning they can spread the HBV for the rest of their lives, they are more likely to pass the virus to other people.

6. Conclusion

The result of the study showed the prevalence of risk factors of HBV is higher in male academic staff, than it is in female academic staff of higher institutions. The prevalence of the risk factors among students of tertiary institutions in Niger State could exist but with equal chances of being exposed to the risks by male and female students alike. The results of the study may be used in making a reliable conclusion concerning other tertiary institutions in Nigeria. This is because the identified health risk factors of HBV have gradually been increasing, especially, as some of the male academic staff, and many students indulge in illicit sex which is a common 'freedom practice' among the inhabitants of many tertiary institutions in Nigeria.

7. Recommendations

- Staff and students of institutions should ensure they are vaccinated against HBV so as to build immune defense against all odds.
- Educational programs should be organized by school authority, departmental organizations, clubs and societies of the various institutions to provide awareness and explanations on how infectious the disease could be so as to prevent its spread within the institutions.

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Technological Integration in Management Curriculum

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Abstract. Curriculum is the programme of instruction students are exposed to in the teaching and learning process. It is all the teaching and learning activities teachers and students are engaged in a formal school system from the beginning of the course of study or training to the end. For effective utilization of the curriculum there is the need for proper classroom management which involves students, subject matter, learning materials and learning environment in an orderly manner. However, the educational system is witnessing digital transformation driven by technological advancement which seems promising. To keep pace with this novel phenomenon and benefit from the usage, management education needs to equip teachers with the knowledge and skills necessary to leverage this technological advancement through its integration in curriculum. This paper therefore examines the technology to be deployed to the classroom for effective management of students, its benefits, potential approaches and considerations for successful implementation.

Keywords: Technology, Educational Technology, Integration, Classroom Management, Curriculum.

1. Introduction

Classroom management is a complicated process in which teachers deal with unexpected situations and a changing teaching and learning environment to maximize students' learning achievement. Management competency requires teachers to have knowledge and skills in effective management of classroom, support learners during learning process, as well as identify and interpret situations which could come up in the classroom. Beside this, they need to encourage students to participate in learning activities, solve learners' problems, improve collaborative relations in the classroom, motivate students to learn, prevent and manage undesirable behaviours (Glock & Kleen, 2019; Hochweber et al., 2014; Hofman, 2022; Korpershoek et al., 2016; van Driel et al., 2022). Nevertheless, to achieve effective classroom management there is need for technology driven environment for the reason that "technology-enhanced learning environment yields benefit in changing pedagogical styles, applying new teaching strategies, accessing useful information sources, organizing and managing the learning environment" (Casanova et al., 2020; Fayez et al., 2021; Mei and May, 2018); (Nguyen et al., 2022).

1.1 Classroom Management

Hornby (2014) defines management as "the act or skill of dealing with people or situations in a successful way, such as classroom management". Classroom management are strategies used by teachers in dealing with students in teaching-learning process in successful manner. "It involves a complex system, made up of many parts which includes the classroom environment, teacher-student relations, behavioral expectations and consequences, as well as daily routines "(Antoine, Nu-man & Reyes-Aceytuno, 2024). However, demonstrating effective approaches in classroom management allows teachers to decrease the behaviors that block learning for both single students and groups of students, while increasing the behaviors that enrich learning. Effective teachers exhibit strong classroom management skills. Less effective teachers have disorganized classrooms, loaded with students who are distracted, off task, or not paying attention to the lesson" (Antoine, Nu-man & Reyes-Aceytuno, 2024). Moreover, instruction and student learning are impacted when there is no classroom management in place. Chaos becomes the norm when classrooms do not have established behavior expectations, are disorganized, or when students are allowed to be discourteous. Nevertheless, "discipline, classroom management, and engagement

strategies are critical in developing a risk-free environment where students are engaged in learning" (Rischer, 2009, p. 47). Educators who possess a sound classroom management system allow for a learning environment where both teachers and students can thrive. Research conducted over 30 years indicates that classroom management is a key element in successful teaching (Marzano, 2003).

1.2 Technology

Technology is the application of conceptual knowledge for achieving practical goals, especially in a reproducible way (Skolnikoff, (1993) through hardware (machines) and software; while educational technology (commonly abbreviated as edutech, or edtech) is the combined use of computer hardware, software, and educational theory and practice to facilitate learning *(*Robinson, Molenda, & Rezabek, 2015; Mastellos et al, 2018). There are a number of ways teachers can use educational technology in the classroom to facilitate learning and one of which is through classroom management.

2. How Technology Supports Classroom Management

With the ever-growing list of teacher responsibilities, the use of technology to support classroom management can help relieve some stress of having to juggle all the everyday tasks of teaching. Technology provides teachers the opportunity to track, monitor, and engage students in their learning effortlessly. Ultimately, utilizing technology makes tasks much easier as well as helps educators efficiently manage their classrooms (Colao, 2012). In addition, technology provides a better platform for teachers to celebrate students' accomplishments, reward them for their positive behaviour, and communicate with the parents easier (Antoine, Nu-man & Reyes-Aceytuno, 2024).

Nevertheless, technology enables teachers to access more of the world than ever, so modifying the lesson delivery and how these tools are approached is essential. Making lesson plans to use different applications depends on what is the objective. Technology can seem like a disrupter, or a means of driving a lesson based on how the tools are used. Having tight transitions is a strategy which establishes transitional routines for students to learn. Students adapt quickly to repeated instances without considerable teacher direction. For example, a timer found on the Class123 Timer website tool can be projected on the wall or a screen to alert the students of the time parameters of each assignment and how much time is left to the next transition. This strategy helps to increase instructional time by decreasing the potential chaos and lag time often associated with changes between activities. It also keeps the students alert and engaged in the lesson. Whichever form of management tool a teacher incorporates in class, it is wise to have several tools and plans ready in case the current one is not working (Antoine, Nu-man & Reyes-Aceytuno, 2024).

3. Technology in Classroom Management

There are many different tools and strategies that can be utilized through several digital tools to help with classroom management. These Educational technology tools can help with classroom management by structuring activities for enhancing classroom routines, sharing information with parents regarding students' behaviour, and providing digitally enhanced strategies to help maintain positive learning environments for all students which are discussed as follows (Antoine, Nu-man & Reyes-Aceytuno, 2024):

3.1 Class Dojo

Class Dojo is one of the technology tools that aid teachers in different aspects of classroom management. It helps the teacher with the collection of student data collected and creates weekly or monthly reports. As a result, it allows the teacher to set up positive reward systems. Class Dojo was developed through consultations with teachers and parents in 2011 by a former management consultant and gamer. Class Dojo grants teachers the ability to share information with students and parents in real time with over 30 languages in which it can translate. It is a versatile app which is accessible by computer, tablet, and smartphone. Class Dojo has eight different tools within the toolkit, as described below:

Direction: Direction is a tool the teacher can use to display instructions for students electronically.
Music: Music can be played as background music to enhance the class environment.
Think Pair Share: Class Dojo allows users to create a digital display of prompts for students to turn and talk with a partner using the Think Pair Share strategy.
Random: Random is random student generator that helps the teacher select a student for checking for understanding or to volunteer.
Today: The today feature functions as a display for daily messages and bulletins to students.

3.2 GroupMaker

GroupMaker is another technology tool that has multiple features to improve classroom management

and increase productive student collaboration by listing all group members. GroupMaker randomly assigns students to pairs, or groups of threes, fours, or more. Currently, it is only available for iPhone, iPad, and iTouch. The primary focus of the app is to create and manage various student groups. GroupMaker has a feature for student pictures that could assist substitutes in identifying all students who need to be in groups. Similar to Class Dojo, other features of GroupMaker are:

Timer: The timer feature embedded to help with transitions, group work, independent work, etc. Just like utilizing a timer in the classroom, this application allows the teacher to project the timer on the whiteboard and create student groups. This allows a visual for the students while they work on the task at hand. It can provide structure and feedback to students.

Noise Meter: A Noise Meter monitors class noise levels with visual displays to help students self-manage. This feature monitors student noise level and reminds the class if their volume is appropriate and conducive to the learning environment. It can provide structure and feedback to students.

3.3 Class123

Class123 is a free downloadable classroom management medium with several classroom tools and communication resources. Class123 is available on both a mobile app and on a web-based app on the desktop. This classroom management medium aids with the daily routines that teachers face while involving parents in their child's participation in the classroom. In addition, Class123 creates the atmosphere classroom management is a more entertaining experience as teachers build their confidence in the classroom setting. The application is colourful and laid out with avatars representing the students. It provides the teacher opportunity to give instant feedback from a mobile device or computer to students. It also has two other features: 'Lucky Draw' and 'Timer.' The 'Lucky Draw' feature will randomly select any number of students, set by the teacher, revealed on the whiteboard (if teacher allows it). The 'Timer' has a handy countdown and stopwatch resource that can time sections of the lesson or tasks. The animations for these features are amusingly appealing and supplemented by a notes section at the end. Similar to other learning management system (LMS), other features of Class123 are:

Digital Chalkboard: This digital board can be used to display information and work through problems which can be saved and reused by teachers or students. It can also provide structure and feedback to students.

Bell: The bell is a feature for a teacher to use to call the class to order.

Goal Setting: This item allows for teachers to place goals within the lesson for students to work towards to achieve.

Feedback: Teachers can receive feedback from parents and student and send feedback to parents and students.

Customization: Class123 allows students the ability to customize their app by allowing them to customize the interface and settings to match their specific preference.

3.4 Skolera school management software

Skolera smart classroom management system through its software provides schools with a platform on which teachers can upload diagrams, materials, notes, and resources; share and attach content and files with their students as well as videos of themselves explaining the lessons. Using it, students can also access notes, slides, and videos from a learning management system (LMS) equipped with cloud storage. Assessment and assignments can also be completed on the system. The class is where they ask questions, get a more complete understanding, and put the new knowledge and skills into practice. This also facilitates the self-directed learning approach of experience first and foremost, invented by progressive education movement and John Dewey. Self-directed learning is one of the best advised effective classroom management strategies for new teachers, which motivates students to lead the way to their own futures. This approach can be used effectively in classroom management by incorporating it in several ways starting from lesson plans design to using classroom management technologies, learning management system (LMS), gamification, and online resources (Nasr, 2024).

3D simulations and videos

3D simulations and videos can be used be used in effective learning and thus ensure an orderly classroom. Teachers top priority is ensuring that students reach their educational goals. Since students often learn in many different ways, incorporating new modalities in the classroom can help maximize learning opportunities and ensure the success of each student (Interplay Learning, 2023).

3.5 Web-based apps.

There are some promising classroom management web-based apps available to teachers that they can used in effectively managing their classrooms. "Keeping students' attention, guiding them through lessons, and making sure the classroom environment is respectful, supportive, and productive takes

constant effort and sucks a lot of time and energy out of the teachers' day. However, these great classroom management tools can be teachers' time-saving and energy-freeing sidekicks, helping them instantly deliver and assess learning, create seating charts, improve students' behaviour, and set timed tasks to make the classroom run like a well-oiled machine. They can also help the teacher manage class discussion, even asynchronously, and get a clearer picture of participation (Common sense education, 2024) which include the following:

Class Charts: Class Charts is a seating chart system which makes managing classroom behaviour simple.
Bottom Line: An easy-to-use, engaging tool for managing student behavior and participation, especially if the teacher focus on the positive.
Grades: K–6
ClassDojo: ClassDojo is an exemplar bridge between home and school which also aids learning.
Bottom Line: When used thoughtfully, ClassDojo can help adults support students' growth through goal-setting, reflection and celebration.
Grades: K–6
Additio: Additio is a flexible, feature-filled learning management system (LMS) which facilitates focus on whole child.
Bottom Line: Being able to access lots of customizable data, group students beyond classes, and communicate easily with families gives teachers a clear picture of each student that they can share.
Grades: K–12
Bloomz: Bloomz is an effective district-wide communication platform for school and home.
Bottom Line: This multifunctional platform provides many ways for districts, administrators, teachers, families, and students to connect and offers a ton of features—perhaps even too many, for some.
Grades: K–12
Bouncy Balls: Bouncy Balls measure classroom sound levels with simple fun themes.
Bottom Line: This is a fun tool that offers a silly but possibly effective solution to managing noise levels.
Grades: K–12
sskick: sskick assign, assist, and assess with real-time, interactive classroom.
Bottom Line: It is a great option for teachers who want to go paperless, provide specific feedback, and encourage collaboration among students in virtual or 1-to-1 classrooms.
Grades: K–12
Equity Maps - Chart Dialogue: Equity Maps-Chart Dialogue is a real-time participation tracker shows who is talking in the classroom.
Bottom Line: If used delicately, this is a potentially eye-opening tool that can help teachers modify discussions.
Grades: K–12
FreshGrade Connect: FreshGrade Connect is a multimedia digital portfolios which connect students, teachers, and parents.
Bottom Line: It is designed with student learning in mind, and teachers can encourage students to submit quality content and engage in reflective feedback.
Grades: K–12
LessonUp: LessonUp is a flexible interactive presentation tool which engages kids at school and home.
Bottom Line: It is great for creating customized and differentiated lessons, but it might not be accessible for every student.
Grades: K–12
Nearpod: Nearpod engage and assess students with media, videos, and interactive slides.
Bottom Line: The teacher-or student-paced learning can improve 1-to-1 environments and the learning activities are top notch.
Grades: K–12
Otus: Otus is free learning management system (LMS) which feels rich in offering data-driven differentiated instruction.
Bottom Line: This teacher-created site solves more problems than it causes, but it will take some up-front professional development to take full advantage.
Grades: K–12
Seesaw: Seesaw is a versatile digital portfolio which appeals to teachers, students, and parents.
Bottom Line: A powerful multimedia learning and communication tool that demonstrates student progress over time.
Grades: K–12
Time Timer: Time Timer manage and conceptualize time with great visuals, but with a few bugs.
Bottom Line: A decent option for visual timer needs, being sufficiently customizable, but there are still a few bugs and room for improvement.
Grades: 1–12
Google Classroom: Google Classroom is an exceptional, simple communication, collaboration, and document sharing.
Bottom Line: Though it does not have it all, it is an incredible tool for managing and organizing learning.
Grades: 3–12
ClassroomQ: ClassroomQ minimize classroom distractions with virtual hand-raising tool.
Bottom Line: An easy way to gauge understanding, adjust instruction, and provide student support in real time.
Grades: 3–12

Classwork Zoom: Classwork Zoom keep tabs on student workflow with handy Google extension.
Bottom Line: Classwork Zoom can be a great tool for any teacher who frequently assigns Google documents.
Grades: 3–12
Along: Along messaging tool helps classrooms forge and foster meaningful dialogue.
Bottom Line: This tool opens up avenues for conversation and relationship building between teachers and students.
Grades: 4–12
Classcraft: Classcraft motivate students and monitor behaviour with clever gamified platform.
Bottom Line: When used thoughtfully, this classroom gamification can encourage positive behaviour and develop essential collaboration skills.
Grades: 4–12
ClassFlow: Classflow is a robust lesson creation and delivery tool which aids assessment.
Bottom Line: With some creativity, this interactive platform can support instruction and assessment.
Grades: 4–12
Parlay: Parlay is a comprehensive discussion platform which develops critical-thinking skills.
Bottom Line: A great tool in any subject or topic for teachers looking to make discussion a central part of their classroom.
Grades: 5–12
Schoology: Schoology is a robust learning management tool which comes with challenges.
Bottom Line: With patience and creativity, it can evolve into a rich learning management system.
Grades: 3–12
Showbie: Showbie is a flexible desktop, mobile assignment tool works best with pro features.
Bottom Line: A flexible way to collect student assignments and offer written and verbal feedback, especially with the premium features.
Grades: 5–12
Peergrade: Peergrade is a feedback tool with great rubrics which might work best for older students.
Bottom Line: With appropriate teacher support, this could be a powerful way to help teach students about giving and receiving critical feedback.
Grades: 6–12
Credly: Credly is a great how-to content, flexible features boost digital badge tool.
Bottom Line: A useful tool for issuing digital badges.
Grades: 7–12
GradeCraft: GradeCraft use a game-inspired classroom structure to offer some autonomy and flexibility.
Bottom Line: GradeCraft has the potential to revolutionize the teacher's classroom by inspiring students to take control of their own learning.
Grades: 9–12
Notion: Notion is a cool, customizable tool which turns notebooks into workspaces.
Bottom Line: With some scaffolding, this could be a great way to capture, organize, and share information without juggling a class site, notebook, to-do list, and more.
Grades: 9–12
Discord: Discord is a social hub which offers a novel but tricky spin on classroom communication.
Bottom Line: With some creativity and moderation, this student-loved messaging alternative to Google and Microsoft could be a key extension of the classroom.
Grades: 10–12
My Study Life - School Planner: My Study Life-School Planner is an organizational tool makes managing complex schedules a cinch.
Bottom Line: If teachers can make it a habit by the use of this tool; students will love staying on top of assignments and test dates with this handy, pocket-sized "personal assistant."
Grades: 10–12

4. Importance of Technology in Classroom Management

Classroom management technologies are not only changing the way education is, but they are also allowing teachers now to go beyond merely making sure the learning objectives are fulfilled. They are letting educators open up a new world of innovation, positive personality and behaviour development, and success to their students. Smart classroom management allows the teachers to empower their students and prove that not only can technology be a tool for learning but also for making things happen. Now they are free to share their views with not only their peers but with the whole world with a single click of a button. Moreover, it can expand the limits of teaching skills, so that along with successfully managing the class, teachers can also allow their students to do, not just think and learn. Technology in classroom has many perks. It allows the teacher to learn more every day about students and explore all the possible it offers for better learning, organization, pedagogy, and better student engagement. However, here are four advantages of using technology in classroom management (Nasr, 2024):

4.1 Classroom management technologies allow for better control

Teachers have a whole lot better classroom control with technology on their side. Controlling the

classroom is one of the most essential teaching skills of a good teacher. It can be quite aggravating having to fear losing grip on the class. Classroom management technologies, e.g., Skolera school management software, can help with that. With effective classroom management and using the right tech, students can stay focused on their lesson, engaged with the knowledge they are acquiring, and organized as well. In conjunction, with competing and dynamic behaviour management techniques, teachers are able to maximize classroom time by minimizing any possible classroom disruption or student misbehavior mid-class.

4.2 The best behaviour management strategies

Classroom management technologies also allow students more independence. Through shared learning documents, videos, audios, and interactive images, they can be free to learn independently. Classroom management technologies open up the possibility for students to choose their own kind of learning. Having this right makes them have more ownership and responsibility for what the knowledge they are acquiring every day. In addition, with classroom management software system Skolera, teachers can more fully use flipped classrooms strategy, which involves students getting a grasp of the material before class by watching the presentation and preparing any questions they may have.

4.3 Classroom management technologies: better engagement

Classroom management technologies are a great way to creates fun and come up with interactive, engaging lessons for your students. Skolera has recognized the importance of all those aspects and has also created a feature called 'zones' through which students, teachers, and parents can take part in extracurricular activities. A Chinese proverb says:
"If you tell me, I'll forget; if you show me, I may remember; if you involve me, I'll understand"

Nevertheless, in line with this statement it is pertinent to posit that gamification is one of the most exciting tools classroom management technologies offer. Gamification drives challenge and motivation, especially if it is part of the subject lesson plan. Advanced classroom management software systems get the dull, monotonous atmosphere out of the class and colour it with the excitement of playing learning games. Gamification in itself is an old concept. It is being used for ages now. However, what is really new about it is that it is considered one of the behaviour management strategies that can be integrated into technology. Moreover, gamification is a learning approach used to motivate students through learning games in order to reach the highest levels of engagement and participation within the classroom, or outside if the teacher is using classroom management software. This approach can even affect students' behaviour; it makes them more open to learn and excited to get back to the teacher and colleagues to share the feedback with them. In addition, it allows them to also relate to what they actually want and how they think! And it is one of the very good classroom discipline ideas for teachers as well. To make gamification more related to the learning objectives teachers use Skolera's badges and Hall of Fame, which allows them to motivate students by placing up to five students in the list. No criteria are set for the Hall of Fame, but the choice of students is left to the teacher's discretion. Also, for every homework or task a student makes, points are added. The following are seven advantages of Classroom Management Technologies Gamification:

- Motivating students to be a leading part of the self-directed learning model.
- Allowing learners, a safe, virtual environment for trial, where they can fail and fail again before succeeding without a real negative outcome.
- Although it is only virtual, it is also connected to the learning objectives of the class: practical.
- Drives them to work harder in order to see the rewards of this learning activity.
- Giving students the opportunity to learn with more freedom.
- Class is just way much more fun!
- Learning that technology is essentially used not just for fun but for learning and experience.

4.4 Make Classroom Management, Grading, and Revision Easier

Teachers' daily routine is never ending. They have a lot of work to do: revision, correction, grading, organization, etc. With technology, teachers can use classroom management software to make that work a little lighter. Using Skolera, students will immediately know their grades and the teacher's comments either through their mobile phones or computers. Moreover, this gives the teachers much needed time to direct efforts more fully towards coming up with better classroom management ideas and improving the educational material and teaching strategies as well as student performance.

5. Challenges in Integration of Technology into Management Curriculum

Despite its myriad benefits, integrating technology into management curriculum poses several challenges such as:

Lack of knowledge: Most teachers lack knowledge, skills and experience in handling educational technology tools in classroom management due to the dynamic nature and the continuous production of numerous novel educational management technological tools.

Resistance to change: Educational institutions and teachers may find it difficult to cope with technological innovations in classroom management practice which may lead to resistance in adopting new technologies, impede integration effort requiring cultural shifts and professional development initiatives.

Curriculum Relevance: Rapid technological advancements necessitate frequent curriculum updates to ensure alignment with industry needs and emerging trends, posing challenges for curriculum design and implementation.

Cost of educational technology tools: The cost of educational technology management tools may deter teachers from accessing and effective usage of these technological tools in classroom management.

Maintenance of technology tools: Due to lack of experienced engineers and cost of maintaining educational technology tools in classroom management may hinder the effective usage.

Pedagogical adaptation: Integrating technology requires rethinking pedagogical approaches to leverage interactive, experiential, and collaborative learning methods that harness the potential of digital tools which most teachers lack.

Lack of accessibility: Some of the educational technology management tools such as LessonUp might not be easily accessible for every student.

Technological challenges: Some of the educational technology management tools pose challenges such as Schoology, Otus which "solves more problems than it causes" and Time Timer which has a few bugs.

6. Considerations for successful implementation of technology into management curriculum

Overcome these challenges, maximizing the benefits of technology and successfully integrating technology in management curriculum requires careful consideration of the following:

- Educational institutions should train teachers through seminars and workshops on means of utilizing available technological management tools. Providing them with training and support in utilizing technology-enhanced classroom management tools fosters a culture of innovation and enhances effective classroom management.
- Educational institutions should train students through seminars and workshops with needed skills on the use of educational technology tools for effective learning and classroom management.
- Government and educational institutions should make available educational technology tools to teachers as this would assist in them in effective classroom management.
- Experienced engineers should be employed for proper maintenance of educational management hardware and software technology tools for effective usage.
- Constant training should be organized for curriculum planners to keep them abreast with educational management technological innovations needed to be included in the curriculum.
- Educational institutions should make educational technological tools for learning and classroom management easily accessible to every student.
- Researchers should develop means of resolving some of the challenges pose by the use of educational technology management tools in the classroom.
- Educational institutions should have continuous assessment and feedback mechanisms on the use of technology in classroom management. Implementing performance-based assessments and feedback mechanisms enables continuous evaluation of teachers' technological competencies in classroom management and informs instructional improvements which should be encouraged as it would in a long way assist in developing and improving management education.

7. Conclusion

Schools have marched into the digital age and teachers in classroom management and school discipline need to follow suit for effective learning to take place. However, "teachers are often cautious and mindful at initial marking periods, but as the semester/term proceeds, interactions with students are moving along

well and the expectations relax a bit. At times, this can result in a classroom that starts getting out of control. Having a classroom with students who are testing their boundaries causes frustration. Using these strategies regularly will work to create results in student behaviour in any class (Antoine, Nu-man & Reyes-Aceytuno, 2024), effective classroom management and an enhanced students' academic performance. Moreover, technological integration is no longer an option but a necessity for effective classroom management. By embracing technology and adopting innovative educational management, educators can prepare future managers with the skills and knowledge needed to thrive in a technology-driven business world. Nevertheless, technological integration in management curriculum holds promise for enhancing the relevance, effectiveness, and inclusivity of classroom management. By leveraging theoretical frameworks, methodological approaches, and empirical findings, scholars and practitioners can advance understanding of best practices and challenges in integrating technology into management curriculum, ultimately preparing students to thrive in the digital era for the benefit of mankind.

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The Need for a More Robust Education Studies: The Impact of Mediation and Moderation Variables for Deeper Insights

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Abstract. Incorporating mediation and moderation variables into education studies has theoretical and empirical ramifications that this study intends to investigate. A foundation for comprehending the intricate links and mechanisms influencing educational outcomes is offered by this research. To determine the essential ideas and elements associated with mediation and moderation, a comprehensive analysis of pertinent literature and research studies in the field of education was carried out. A thorough model that demonstrates how mediation and moderation variables can be incorporated into education studies was created based on this investigation. In elucidating the links between diverse educational characteristics, the research emphasises the importance of mediation and moderation. It illustrates how some variables influence the relationship between independent and dependent variables by acting as mediators, and how other variables influence the degree or direction of these associations by acting as moderators. A more comprehensive understanding of the underlying mechanisms and contextual factors influencing educational outcomes is provided by the inclusion of mediation and moderation variables in education studies. Through the integration of various variables into an all-encompassing model, scholars can acquire a more profound understanding of the intricate dynamics involved in educational processes and results. Policymakers and educators should consider the practical ramifications of implementing the suggested model. By focusing on these aspects, policies and interventions can be created that will improve teaching methods and raise student achievement.

Keywords: Mediation, moderation, education studies, Methodological challenges, Measurement limitations, Statistical techniques.

1. Introduction

Education studies play a crucial role in shaping policies, practices, and interventions aimed at improving learning outcomes and educational experiences. But even with all of the research done in this area, there is still a need for more thorough and reliable methods of examining educational phenomena (Aguinis et al., 2017). Including mediation and moderation variables is one topic in education research that has been comparatively underutilised (Memon et al., 2018).

A greater knowledge of the intricate relationships between various aspects in educational settings is made possible by mediation and moderation variables. The underlying methods or procedures by which one variable influences another are explained by mediation variables (Arumugam et al., 2016). Conversely, moderating variables look at the circumstances in which two variables' relationship varies. Researchers can improve the validity and generalizability of their findings in education studies by including these variables, which will result in more effective educational interventions and well-informed decision-making (McMahon et al., 2021).

The use of mediation and moderation variables in education studies is still lacking in research, despite its possible advantages. Numerous research in the field frequently ignores the complex dynamics and subtleties that mediation and moderation effects might shed light on in favour of only looking at direct correlations between variables (Aguinis et al., 2017). This exclusion hampers our comprehension of the

numerous mechanisms and contextual factors that influence educational results.

Including mediation and moderation variables in education research can lead to several substantial benefits. Firstly, it allows for a more thorough knowledge of the underlying processes and routes via which educational interventions or practices effect outcomes. By identifying and evaluating these mediating variables, researchers can reveal the mechanisms that drive change and suggest potential points of intervention for improving educational outcomes (Garzón et al., 2020).

Second, by include moderation variables, researchers can investigate the circumstances in which different educational approaches or interventions have different impacts. This knowledge is essential for modifying therapies to fit certain situations, groups of people, or circumstances, thereby boosting their efficacy (Lee et al., 2018).
Furthermore, taking moderation variables into account aids in the identification of potential boundary conditions or other elements that can restrict the generalizability of results, encouraging more complex and contextually aware educational research (Arumugam et al., 2016).

To increase the validity of research findings, mediation and moderation variables must be included in education studies. By doing this, we can acquire a deeper comprehension of the intricate dynamics and mechanisms influencing educational results. The creation of evidence-based practices, policies, and interventions that have a significant influence on educational environments can then be informed by this. In order to give researchers a roadmap for conducting more thorough and illuminating studies in this area, this paper delves deeper into the theoretical underpinnings, methodology, and model for factoring mediation and moderation variables in education research.

To explore studies from other disciplines that have successfully incorporated these variables and their impact on research outcomes. Mediation and moderation factors are extensively employed in several disciplines beyond education, including psychology, sociology, economics, public health, and management. For instance, in psychology, contextual influences and underlying mechanisms are understood through the use of mediation and moderation analyses on psychological processes. These variables are used in economics to investigate the ways in which particular factors mediate or modulate the relationship between economic variables. The impact of mediation and moderation variables on research outcomes is evidenced by the body of existing literature. These parameters allow for more nuanced interpretations of research findings and improve our understanding of intricate connections between variables. They also shed light on underlying systems. By incorporating mediation and moderation, researchers can give more complete and contextually sensitive insights, leading to better informed decision-making and focused interventions in different fields, including education.

In the area of business management, Chen and Lin's (2019) investigation looked at the connection between job satisfaction among employees and leadership style. In order to find out if the link between job satisfaction and leadership style altered depending on the organisational environment, the researchers included organisational climate as a moderating variable in their study. The results showed that in a favourable organisational climate as opposed to a bad organisational climate, there was a higher correlation between leadership style and work satisfaction. In order to determine the circumstances in which leadership styles have the biggest influence on employee outcomes, this study underlined the significance of taking moderation factors into account (Al-Sada et al., 2017).

The research done by Brown et al. (2018) on the connection between teenage mental health outcomes and physical exercise is one noteworthy study from the subject of public health. Self-esteem was incorporated as a mediation variable in this study to help the researchers understand how physical activity affects mental health via the self-esteem mechanism. The results showed that the association between physical exercise and outcomes related to mental health was largely mediated by self-esteem. This study emphasises how crucial it is to take mediating factors into account in order to understand the fundamental mechanisms by which physical activity affects mental health (Biddle et al., 2019).

Johnson and Smith's 2016 study examined the relationship between economics achievement in school and income levels. In order to investigate the role of occupation as a moderating variable, the researchers looked at whether there were variations in the relationship between income and educational attainment based on the type of occupation. The findings indicated that there was a stronger positive correlation between income and educational attainment among those in high-skilled occupations compared to those in low-skilled occupations. This study shows that in order to determine the contextual elements influencing the relationship between income

and education, moderation variables must be taken into consideration (Fan et al., 2017).

Furthermore, in the area of communication studies, Lee and Kim (2017) looked into how young people' unhappiness with their bodies was affected by media exposure. The present study incorporated social comparison as a mediation variable to investigate the manner in which media exposure impacts body image dissatisfaction via the social comparison mechanism. The results showed that the association between media exposure and negative body image was partially mediated by social comparison. This study emphasises how crucial it is to take mediating variables into account in order to understand the underlying mechanisms by which media exposure influences negative body image (Cohen, 2015).

These multidisciplinary studies highlight the need of including mediation and moderation variables in research as well as their effects. Researchers were able to comprehend contextual influences, unearth underlying mechanisms, and provide a more thorough explanation of the interactions between variables by incorporating these variables. These research' effective integration of mediation and moderation variables has greatly expanded the body of knowledge in the field and offered insightful information for the creation of new theories and useful applications.

These examples show how education researchers might use knowledge from other domains to strengthen the validity and robustness of their own investigations. By including mediation and moderation variables, researchers can gain a deeper understanding of the complex dynamics present in educational contexts and provide conclusions that are more nuanced, contextually sensitive, and applicable to real-world scenarios.

The success of using mediation and moderation factors in research is demonstrated by these examples from various fields. Through the incorporation of these factors, scholars can reveal the fundamental mechanisms, comprehend contextual influences, and furnish a more all-encompassing comprehension of the correlations among variables. These studies show how important it is to take moderation and mediation factors into account when producing more complex and sensitive to context study findings.

These examples can be used by education researchers to improve the validity and rigour of their own research. Through the integration of mediation and moderation variables, scholars can enhance their comprehension of the intricate dynamics present in educational environments and provide conclusions with pragmatic ramifications for educational policies, interventions, and methodologies.

1.1 Moderation Variables

Understanding the circumstances under which the connection between two variables shifts depends heavily on the presence of moderation variables. These variables aid in the identification of individual variations or environmental factors that affect the direction or degree of the link between the independent and dependent variables by researchers. Fundamentally, moderating variables establish the circumstances and individuals for whom the correlation between variables is greater or weaker (Lastrucci, et al., 2019). A few crucial aspects of moderation variables should be taken into account. First, the dependent variable is influenced by the interaction between the moderation variables and the independent variable. The impact of the independent variable on the dependent variable varies depending on the amounts or values of the moderating variable. This interaction effect might be additive or multiplicative. Second, the nature of moderation variables is usually continuous or categorical. While continuous moderation factors vary along a continuum, categorical moderation variables split the sample into discrete categories (Aguinis et al., 2017).

Examining both the particular research issue under investigation and the theoretical framework are necessary steps in identifying moderation variables in a study. Numerous factors that could affect how the independent and dependent variables relate to one another can be taken into account by researchers. These factors may consist of personal traits like age, gender, or socioeconomic position, or they may be environmental traits like school size or neighbourhood features, or they may consist of other pertinent variables found in earlier studies. The choice of prospective moderating variables ought to be informed by theory, empirical data, and the particular subject of the investigation (Hankonen et al., 2017).

There are a number of potential moderating factors in education studies that researchers should take into account. For example, an educational intervention's effect on student achievement can change based on the student's academic aptitude or past knowledge. Here, scholastic aptitude or past knowledge could be useful moderating factors. The association between parental participation and academic performance may also be influenced by the social level or cultural background of the family. These factors may have an impact on the

direction or intensity of the link between student outcomes and parental participation.

Scenario 1: A novel teaching strategy's impact on student involvement is being studied by a researcher. He makes the hypothesis that, depending on the students' grade level, there may be differences in the link between the teaching strategy and student participation. In this case, grade level might be used as a potential moderating variable and the researcher would examine how the impact of the teaching technique on student involvement differs between grade levels.
Scenario 2: A study's objective is to look at how the school climate affects students' wellbeing. The researcher hypothesised that for students of different genders, the connection might be different. Using gender as a potential moderating variable, the researcher would look into how the relationship between school climate and student well-being varies for male and female students.
Scenario 3: A researcher is researching the impact of parental participation on academic attainment. She makes the hypothesis that the student's capacity for self-control may influence the relationship. In this case, kids' level of self-regulation abilities would act as a potential moderating variable, and the researcher would investigate how this modifies the association between academic accomplishment and parental participation.

These examples show how moderation variables can be found and used in educational research to comprehend the circumstances in which the variables' relationship varies. By studying individual variations and contextual factors, researchers can learn more about how different educational factors relate to one another and how effective educational interventions are.

1.2 Mediation Variables

Understanding the fundamental mechanisms or processes by which an independent variable affects a dependent variable requires an understanding of mediation variables. By highlighting the intermediary stages or channels through which the impact happens, they aid in providing an explanation for the "why" and "how" of the relationship between variables. Put differently, the role of mediation factors is to clarify the causal relationship between independent and dependent variables (Yoon, 2020). Mediation variables have the following characteristics: they can explain the relationship between the independent and dependent variables; they can account for changes in the relationship when the mediator is included in the analysis; and they have a temporal ordering between the independent and dependent variables (Yoon, 2020). In order to determine the mediation variables in a study, the theoretical framework and research topic must be carefully examined. Variables that are likely to explain the relationship between the independent and dependent variables and are theoretically linked to both should be taken into account by researchers. These variables ought to make sense theoretically and be backed up by data from earlier studies (Vancouver, 2014).
Researchers may take into account a number of potential mediation variables in the context of education studies. For instance, a researcher may propose that student involvement acts as a mediating variable in a study examining the relationship between a teacher's instructional strategies and student accomplishment. The method via which a teacher's instructional strategies affect students' academic performance is known as student engagement.

Scenario 1: The effects of a social-emotional learning programme on students' wellbeing are being studied by certain researchers. They suggest that the relationship between the programme and the well-being of the students is influenced by self-efficacy, which functions as a mediating variable. To assess the mediating role of self-efficacy in the relationship between programme and well-being, the researcher gathers data on programme implementation, student well-being, and self-efficacy.
Scenario 2: The purpose of a study is to determine how parental participation affects students' motivation. According to the researcher's hypothesis, this relationship is mediated by students' perceptions of their own competence. The researcher gathers information on student motivation, parental participation, and self-perception of competence in order to examine this hypothesis. Through an examination of the mediating function of self-perception of competence, the investigator can acquire a deeper understanding of the fundamental process by which parental participation impacts student motivation.
Scenario 3: An investigation is conducted into how a technology-based intervention affects the learning outcomes of students. According to the study, the association between learning outcomes and the technology intervention is mediated by participation in the intervention. To evaluate the mediating role of engagement in the relationship between the intervention and learning results, the researcher gathers data on the intervention, student engagement, and learning outcomes.

These examples show how mediation variables can be found and used in education research to find the pathways by which independent factors affect dependent variables. Researchers can better understand the mechanism by which educational practices, interventions, or factors influence results by taking mediation variables into account. This knowledge can help to enhance educational practices and policies and guide the creation of focused solutions.

Social science theory is the foundation of both mediation and moderation, and education studies greatly benefit from its use. Effective interventions and practices in education research depend on an understanding of the mechanisms (mediation) via which educational factors influence results. Researchers can learn more about the mechanisms underlying how and why particular educational elements affect students' learning, motivation, or well-being by identifying mediating variables. In education studies, moderation variables play a crucial role in identifying the contextual factors and individual variations that influence the efficacy of educational interventions and the interrelationships among educational factors. Researchers can identify the circumstances in which specific interventions or causes have a higher or lesser influence by taking moderation variables into account. This enables more specialised and targeted approaches to teaching.

2. Methodology

A variety of research methodologies and data gathering techniques can be used by researchers to examine mediation and moderation variables in education. The study's unique setting, resources that are available, and research objectives will all influence the methodological choice.

2.1 Research Design and Data Collection Methods

Experimental Design: Taking into account mediation and moderation variables, researchers can conduct controlled experiments to investigate the effect of an independent variable on a dependent variable. This strategy permits control over potential confounding variables, random assignment of participants to conditions, and variable modification (Pirlott, 2016).

Observational Studies: Cross-sectional and longitudinal observational studies are two types of observational research that researchers can use to investigate the correlations between variables and find possible mediation and moderation effects. These investigations rely on natural changes or existing settings for data gathering, without adjusting for any variables.

Surveys and Questionnaires: Surveys and questionnaires can be used by researchers to get participant self-report data. Items evaluating the independent variable(s), mediator(s), moderator(s), and dependent variable(s) may be included in these instruments. This method makes it possible to collect data effectively and with a high sample size (Alordiah & Ossai, 2023; Nima et al., 2013).

Interviews and Focus Groups: Focus groups and qualitative interviews can be used by researchers to acquire deep insights into participants' experiences and perspectives. Rich data on the underlying mechanisms and processes pertaining to mediation and moderation factors can be obtained using these methods (Rosenthal, 2016).

2.2 Target Population, Sample Selection, and Data Analysis Techniques

Students, instructors, parents, or educational institutions are usually the target group for research on mediation and moderation variables in education. The particular population of interest and the study question would determine the sample selection. To assure representativeness or target particular subgroups, researchers can use purposive, stratified, or random sampling procedures.

2.3 Statistical Tools for Mediation Analysis

Sobel Test

One popular statistical method for mediation analysis is the Sobel test. It evaluates the importance of an independent variable's indirect impact on a dependent variable via the use of a mediator variable. To ascertain whether the indirect impact deviates considerably from zero, the Sobel test computes a z-score. The relationship between the independent and dependent variables is fully mediated by the mediator variable, and it is assumed that the variables are regularly distributed (Igartua, 2020). A simple and user-friendly technique for evaluating mediation effects is the Sobel test. It gives researchers a p-value as proof of mediation and enables them to assess the indirect effect's importance. The Sobel test presupposes a normal distribution, a linear connection between the variables, and the absence of measurement error. In order to produce valid results, it also assumes the absence of confounding variables and calls for a high sample size (Özdil, 2019). The Sobel test can be used in education research to investigate how student motivation influences the link between academic achievement and instructor feedback. The

purpose of the test is to ascertain whether there is a statistically significant indirect influence of instructor feedback on academic performance through student motivation.

Bootstrapping

A popular resampling method in mediation analysis is called bootstrapping. It entails randomly selecting observations from the original dataset and replacing them to create multiple samples. Each resampled dataset's indirect effect is computed, producing a distribution of indirect effects. Using these resampled data, researchers can then calculate the confidence interval and determine the importance of the indirect effect (Newman et al., 2017).

Because it is not dependent on the assumptions of normalcy or linearity, bootstrapping is more resilient in a variety of circumstances. It offers p-values and confidence ranges that are more precise, especially for smaller sample numbers. Additionally, bootstrapping enables the investigation of intricate mediation models including numerous moderators or mediators (Koopman et al., 2014). For reliable findings, bootstrapping may need a higher number of resamples and be computationally demanding. Additionally, it can take a lot of time, particularly when working with big datasets. Bootstrapping can be utilised to estimate the confidence interval and assess the importance of the indirect effect in educational research that examines the mediating role of self-efficacy on the relationship between a teacher's instructional methods and student achievement.

Structural Equation Modeling (SEM)

SEM is a thorough statistical technique that makes it possible to investigate intricate correlations between numerous variables. To assess the direct and indirect impacts of independent factors on dependent variables, including mediating and moderating variables, factor analysis and route analysis are combined. SEM offers a framework for evaluating proposed causal models and has the ability to account for hidden variables and measurement error (Muthén, 2015). Multiple mediation paths can be examined, latent variables can be included, and model fit can be evaluated with SEM. It offers a thorough examination of the whole variable system, enabling a greater comprehension of intricate relationships. In order to yield precise estimations, SEM necessitates a greater sample size and can be computationally intensive. Additionally, rigorous model formulation is necessary, and researchers lacking in-depth statistical expertise may find it difficult (Aguinis et al., 2017). Using structural equation modelling (SEM) can help determine the direct and indirect effects, evaluate model fit, and offer insights into the overall system of variables in an education study investigating the mediating role of student involvement on the relationship between a school climate intervention and academic outcomes.

These statistical tools, namely the Sobel test, bootstrapping, and SEM, offer researchers different approaches to analyze and interpret mediation effects in education research. By considering their benefits and limitations, researchers can choose the most appropriate tool based on their research objectives, data characteristics, and statistical expertise.

2.4 Statistical Tools for Moderation Analysis

Interaction Effects

In moderation analysis, interaction effects are frequently employed to investigate how the levels or values of a moderator variable affect the relationship between an independent variable and a dependent variable. In order to determine the importance of the interaction effect, this study incorporates an interaction term into a regression model (Nima et al., 2013).

Researchers can investigate conditional relationships and a variable's moderating influence through the use of interaction effects. They shed light on how variations in the moderator variable's levels affect the direction or strength of the association between the variables. The assumptions made by interaction effects, such as additivity and linearity, may not always accurately represent the nature of the relationship. When higher-order interactions are present, they might be difficult to understand and necessitate a large enough sample size to guarantee accurate estimations. Researchers may include the interaction between parental involvement and student socioeconomic status as a moderator in an education study looking into the effect of parental involvement on academic achievement in order to see if there are differences in the relationship between parental involvement and academic achievement depending on socioeconomic status.

Analysis of Covariance (ANCOVA)

ANCOVA is a statistical method used in moderation analysis to take the effects of covariates into account when assessing the interaction between an independent variable and a moderator variable. The ANCOVA procedure includes regressing the

dependent variable on the independent, moderator, and covariates as well as assessing the significance of the interaction effect. ANCOVA minimises confounding effects for researchers by accounting for covariate influence. It provides a more accurate assessment of the moderator effect by taking into consideration extra variables that may have an impact on the dependent variable. ANCOVA makes the assumptions of regression slope homogeneity, additivity, and linearity. A sufficiently high sample size is required to produce reliable results, and it might be susceptible to changes from these assumptions. (da Silva Faia, 2019). Researchers may use ANCOVA to adjust for student age and prior academic achievement as covariates while assessing the interaction effect in an education study looking at the moderating role of student gender on the link between teaching style and student engagement.

Johnson-Neyman Technique

A statistical method for determining the regions of significance in a moderator effect is the Johnson-Neyman Technique. It establishes the precise values or ranges of a moderator variable at which statistical significance or non-significance is found in the relationship between the independent and dependent variables. The Johnson-Neyman Technique pinpoints the precise circumstances in which the relationship between variables varies, enabling a more thorough analysis of the moderator effect. It gives researchers a precise idea of the parameters that the moderator variable falls inside when influencing the connection. In order to produce reliable results, the Johnson-Neyman Technique requires a large enough sample size and assumes a linear relationship between the variables. If there are high-order interactions or a nonlinear relationship between the variables, it might not be appropriate (Lin, 2020). In an education study investigating the moderating effect of student self-regulation on the relationship between a technology-based intervention and academic outcomes, researchers may use the Johnson-Neyman Technique to identify the specific levels or ranges of self-regulation at which the intervention has a significant impact on academic outcomes.

2.5 Model for Factoring Mediation and Moderation Variables

Table 1: A model for Factoring Mediation and Moderation Variables

Step	Description	Actions	Indicators
1	Identify the Research Objective	Clearly state the primary variables of interest and the research purpose.	Research objective clearly articulated. Main variables identified.
2	Conduct a Thorough Literature Review	Review existing literature in the field. Identify theories, models, or frameworks related to the research objective.	Comprehensive literature review conducted. Relevant theories/models identified.
3	Analyze Existing Data	If applicable, analyze existing data to identify potential moderation and mediation effects.	Existing data analyzed for moderation and mediation effects. Relationships between variables explored.
4	Brainstorm and Generate Hypotheses	Brainstorm potential moderation and mediation variables based on research objective, literature review, and data analysis (if applicable).	List of potential moderation and mediation variables generated. Hypotheses formulated.
5	Seek Expert Opinions	Consult with experts in the field to gather insights and feedback on potential variables.	Expert opinions sought and considered. Feedback received on potential variables.
6	Collect New Data (If Needed)	Design and implement data collection methods to gather new data, including measures for potential moderation and mediation variables.	Data collection methods designed and implemented. Measures for variables included.
7	Analyze the Data	Utilise suitable statistical methods to examine the gathered information. Examine the impacts of moderation and mediation with tools like SEM and regression analysis.	Analysis of the data for impacts of mediation and moderation. The importance and strength of the links were evaluated.
8	Interpret and Discuss the Findings	Interpret the statistical results. Discuss implications of moderation and mediation variables in relation to the research objective.	Results explained in relation to variables that affect moderation and mediation. Discussion of implications.

Step	Description	Actions	Indicators
9	Consider Limitations and Future Research	Consider the study's shortcomings and any possible confounding factors. Determine what needs to be looked at and researched further in the future.	Limitations of the study identified. Potential confounding variables considered. Future research directions suggested.
10	Communicate the Findings	Present the findings related to moderation and mediation variables in research reports, articles, or presentations.	Findings related to moderation and mediation variables clearly communicated. Research reports or articles written.

Table 1 provides a comprehensive guide for researchers to discover moderation and mediation variables in their study, including the necessary actions to be taken and indicators to measure progress and completion of each step.

Identify the Research Objective: Clearly state the primary variables of interest and the research purpose. In this step, the primary variables and the research purpose are defined. Completeness is indicated by a well-defined research goal and well-identified variables.

Conduct a Thorough Literature Review: Examine the body of research in the area to get ideas and find theories, models, or frameworks that are pertinent. This task entails carrying out an extensive review of the literature. A thoroughly documented literature review and the identification of pertinent ideas or frameworks serve as the completion indication.

Analyze Existing Data: Examine current data, if any, to investigate possible moderating and mediating effects. To find correlations and possible impacts, this process entails analysing the data that is already available. The data analysis for effects of moderation and mediation serves as a completion indicator.

Brainstorm and Generate Hypotheses: List possible variables for moderation and mediation based on the research goal, literature review, and data analysis (if available). Making a list of possible variables and developing hypotheses are the tasks involved in this process. Completion is indicated by a list of possible variables and developed hypotheses.

Seek Expert Opinions: Speak with authorities in the area to get insightful opinions and suggestions regarding possible elements for moderation and mediation. This action entails consulting experts and taking their advice into consideration. The inclusion of professional comments and opinions serves as a completion signal.

Collect New Data (If Needed): Provide and execute data gathering methods to get more information if there is currently existing or inadequate data. This procedure includes developing data collection methods and adding metrics for potential variables. The use of variable metrics in data collection methods is an indication of completion.

Analyze the Data: Utilise suitable statistical methods to examine the gathered information. This task entails looking at relationships and performing statistical analysis. The data analysis for effects of moderation and mediation serves as a completion indicator.

Interpret and Discuss the Findings: Analyse the statistical findings and talk about the moderation and mediation variables' implications. Interpreting the results and going over their implications are part of this action. A comprehensive analysis and explanation of the results pertaining to the variables of moderation and mediation constitute the completion indicator.

Consider Limitations and Future Research: Consider the study's shortcomings, such as any possible confounding variables or restrictions on the statistical techniques that were used. This procedure entails evaluating the available data and pinpointing areas that require additional study. The completion indicator serves as a reflection of its limitations and a guide for future research directions.

Communicate the Findings: Deliver the research findings in publications, presentations, or research papers that address the moderation and mediation variables. This step entails presenting the results in a variety of forms in an effective manner. The dissemination of findings in research reports, journals, or presentations serves as a completion indication.

2.6 The potential benefits of including mediation and moderation variables in education studies.

Including mediation and moderation variables in education studies can bring several benefits and enhance the overall quality of research findings.

Researchers can gain a deeper understanding of the underlying mechanisms and processes that impact educational results by incorporating mediation and moderation variables. By taking into account potential mediating factors that explain the relationship between variables, this strengthens the study's robustness and offers a more thorough knowledge of the phenomenon being studied.

Researchers can evaluate and validate theoretical frameworks or models in education through the use of mediation and moderation analyses. Through

investigating the ways in which specific variables mediate or modify the relationships among others, researchers can enhance the credibility of their findings and lay a more robust theoretical framework for subsequent investigations (McLarnon, 2018).

Researchers can better understand the contextual and border conditions influencing educational processes and results by include mediation and moderation variables. This makes it possible to comprehend when and under what conditions the relationships are true better. Researchers can offer findings that are more broadly applicable to various educational contexts and demographics by taking these aspects into account (Arumugam et al., 2016).

Education is a complicated field where many different elements can affect results. Analyses of mediation and moderation provide a fuller understanding of the intricate dynamics at work. Scholars are able to pinpoint the precise mechanisms by which variables interact or mediate one another, resulting in a more sophisticated comprehension of the educational processes and results under investigation.

Practical ramifications for educational policies and practices may arise from the inclusion of mediation and moderation variables in education studies. Researchers can offer evidence-based suggestions for interventions, programmes, and policies targeted at enhancing teaching and learning by having a thorough grasp of the underlying mechanisms and conditions that impact educational results.

2.7 Challenges and Limitations

Methodological problems, measurement constraints, and the requirement for meticulous data analysis using suitable statistical approaches are the main causes of these difficulties.

One of the difficulties in precisely capturing the effects of moderation and mediation is selecting the appropriate study design. Extensive planning is necessary for studies, considering both the chronological arrangement of variables and potential confounding variables. Additionally, it might be challenging to find and sample individuals who accurately reflect the target community because education studies usually involve a variety of student groups and educational situations.

Measurement of mediation and moderation variables may be challenging. Because inaccurate or faulty measurements might distort the results, researchers must ensure that their measurement instruments are valid and dependable. It is crucial to use established and validated measures and to create and validate new measuring instruments as needed (Sikorskii, 2013).

The investigation of mediation and moderation effects requires a thorough assessment of the pertinent statistical techniques. Researchers must choose the right analytical methods, such as regression analysis, structural equation modelling (SEM), or multilevel modelling, based on the study design and research objectives. Invalid statistical approaches might lead to inaccurate interpretations of the results and compromise their validity.

Sample sizes for education studies are frequently restricted because of access issues or logistical limitations to particular demographics. The statistical power to reliably identify mediation and moderating effects may be limited by small sample sizes. To lessen these constraints, researchers had to take into account techniques like power analysis, effect size estimation, and replication studies (Aguinis et al., 2017).

The existence of various variables and complicated interactions in educational research makes it difficult to establish causal linkages. Even though assessments of moderation and mediation offer insightful information, they are not sufficient to prove causation. To support their theories about causality, researchers ought to take into account other strategies like quasi-experimental techniques or experimental designs (Chambers, 2016).

Contextual factors that impact education include but are not limited to cultural, socioeconomic, and institutional variations. The extent to which the results can be applied to other educational contexts may be restricted by these contextual considerations. The contextual specificity of the study must be acknowledged, and the limitations and application of the findings must be properly interpreted and communicated by the researchers.

3. Implications of this study

3.1 Theoretical Implications

By including mediation and moderation variables, researchers can contribute to the development and enhancement of current theories and models in the field of education. Determining the mediating variables helps to expose the underlying mechanisms through which specific factors affect learning outcomes. The theoretical ideas and their connections are therefore clearer. Finding the boundary conditions and contextual factors that influence the correlations

between the variables is another benefit of studying moderating variables. This develops theoretical frameworks and provides a more nuanced understanding of educational processes.

3.2 Empirical Implications

The addition of mediation and moderation variables strengthens the empirical knowledge base in education. By accounting for these variables, researchers can provide empirical evidence of the moderating and mediating impacts in educational settings. This empirical evidence supports the validity and generalizability of the research findings. Additionally, it enables the identification of specific factors that influence learning outcomes, providing decision-makers, educators, and other education practitioners with pertinent data.

3.3 Practical Implications

The inclusion of mediation and moderation factors in education studies has practical implications for educational interventions and practices. Researchers who understand the mechanisms and conditions that mediate or alter the interactions between variables can provide evidence-based recommendations for improving educational outcomes. This can support the development of targeted interventions, instructional strategies, and policies aimed at enhancing the teaching and learning processes.

3.4 Methodological Implications

Incorporating mediation and moderation variables in education studies requires rigorous methodology and the application of appropriate statistical tools. This has implications for the development of research methodology in the field. Researchers need to utilise strong statistical approaches, appropriate measurement devices, and thorough planning to ensure accurate data analysis. This contributes to the advancement and refinement of methodological approaches to complex educational problem solving.

4. Conclusion

The paper highlighted several key points:

A fuller grasp of the underlying mechanisms and contextual elements influencing educational processes and outcomes is possible thanks to mediation and moderation variables. Through the consideration of these elements, scholars can reveal the intricate dynamics at work and acquire a more thorough comprehension of the topic they are studying.

The robustness, validity, and generalizability of study findings in education are improved by the inclusion of mediation and moderation variables. Researchers can create more reliable empirical evidence and fortify the theoretical underpinnings of their investigations by addressing the possible mediating and moderating effects.

Deeper understanding of the intricate dynamics of educational processes and results may be possible by include mediation and moderation variables in education studies. The creation of evidence-based practices, policies, and interventions targeted at enhancing teaching and learning can be guided by this understanding.

When working with mediation and moderation factors, the study stressed the importance of giving considerable thought to the matter and using proper statistical procedures. To guarantee the validity and reliability of their findings, researchers should address methodological issues such limited sample sizes and measurement restrictions.

5. Recommendations

In light of the conclusions and ramifications covered in the paper, the following recommendations are made:

- Researchers studying education should consider incorporating variables related to mediation and moderation into their studies. This will help create a deeper understanding of the complex dynamics affecting educational practices and outcomes.
- Researchers should carefully assess their research designs and select appropriate statistical approaches when working with mediation and moderation factors. This will ensure that their judgements are reliable and accurate. Collaborating with experts in statistical analysis can be beneficial in this regard.
- The development and validation of measuring instruments intended expressly to capture mediation and moderation variables in education should be the main focus of future study. This will improve the accuracy of data collecting and assist in addressing measurement limitations.
- Collaboration between researchers, lawmakers, and practitioners is crucial in the field of education. When they work together, they may ensure that the real-world implementations of research findings that

include mediation and moderation variables positively impact educational practices and policies.

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A Contextual Study of Colossians 1:16-17: And the Implications for Christians on Environmental Sustainability

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Abstract. Nigeria and the world at large are witnessing great Environmental degradation which threatens the c continuous existence of life and other Environmental resources in the ecosystem. The need to address the issue of Environmental degradation which poses great threat to life and other Environmental resources serve as an impetus for this study. The Paper employed biblical historical criticism while applying exegetical rule of context in analysing Colossians1:16-17 and the implications for Christians on Environmental Sustainability. Functionalism and Biocentrism serve as the theoretical framework. The study finds out that there is a significant level of misconception among some Christians about man's place in the creation and his obligations towards other creatures, which lead to the irresponsible usage of Environmental resources. The Paper recommends the need for construction of theological teachings on the care for Environment among Christians.

Keywords: Contextual, Implications, Environmental and Sustainability, Christians.

1. Introduction

The effect of climate change is drastically changing the environment worldwide, including in Nigeria. It has impacted environmental degradation and human livelihood in a way that has resulted in competing demands for natural resources, which has exacerbated conflicts and violence between nations and groups over resource access and ownership in ways that inspire religious reactions. According to the Pew Research Center (2012) over 85% of all individuals have their lives in some way impacted by spirituality, religion, or other faith-based notions, and the vast majority of people in the world identify as religious. The norms and value systems of adherents are significantly impacted by such belief systems and the behaviours that go along with them. Hence the need to look at the role of Christians in environmental sustainability in Nigeria with particular reference to Colossians 1:16-17. Colossians 1:16-17 say "16 For in him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things have been created through him and for him. 17 He is before all things, and in him all things hold together." The above verses are indications of the cosmological theology of Christ which need to harness.

1.1 Background to the Book of Colossians

The background to the book of Colossians can be best understood beginning from looking at the City of Colossae, the Church at Colosse, the authorship of the book, date, place of writing, and the Purpose of writing.

The City of Colosse: The city called Colossae was an important commercial town (Brown 2014:599). It was located at the western coast of Asian minor, about 110 miles from Ephesus. The city was noted for its purple wool being a textile centre. Its population was estimated at about 10,000, and was very much Hellenised. It was a city mixed up with the Jews,

Phrygians, and Greek (Horgan 2014). It was in this city that a church was founded but Paul or any other apostle of the early first century AD.

The Church at Colosse: The origin of the church in this city is unknown. Acts of the apostles does not mention it and did not picture Paul having his evangelism there (Copeland, 2001:3. The establishment of the church is uncertain. At issue is whether Paul himself had ever been there. Some suggest that Paul may have done some work there during his third journey, on the way to Ephesus (cf. Ac 18:23; 19:1). Others point out that Paul's comments imply that he had not personally been in Colossae (cf. 2:1). One possibility is that the church was established during Paul's extended stay at Ephesus, where the effect of his work spread throughout Asia Minor (cf. Ac 19:8-10). It may not have been Paul himself, but one of his coworkers who went out to Colossae. Paul's remarks in the epistle indicate that Epaphras was the one who preached the gospel there (1:5-8) and in Hierapolis and Laodicea (4:12-13). Though he was with Paul at the time the epistle was written, Epaphras is identified as "one of you" (4:12), suggesting that he may have originally been from Colosse.

Although the Jews were quit of great number at Colossae it was evident that Gentile made up the church there. The mention of Epaphras Gentile in 4:10 supports this fact. This is also supported in Col 1:21, 1:5-8.

Authorship, Date and Place of Writing: Copeland (2001) argues that Paul wrote Colossians citing that early sources in church history that attribute this letter to Paul include: Eusebius (300 A.D.), Origen (250 A.D.), Clement of Alexandria (200 A.D.), Tertullian (200 A.D.), Irenaeus (200A.D.), and the Muratorian Fragment (180 A.D.).Besides, Copeland notes that apostle Paul, joined in his salutation by Timothy (1:1), and signed by Paul himself at the end of the letter (4:18).

It was in the 19th century that Paul’s authorship of Colossians began to be doubted, notwithstanding the addition of the words “to the Colossians” in the epistles. About four points are raised in this regard. First is the style of Colossians which does not tally with that of authentic Pauline letters. Second, is the Christology which does not resemble that presented at Philippians. Third is the issue of heresies which was a second century Gnostic teaching. Fourth is its similarity with Ephesians which makes some scholars think that Paul would not be repeating himself in the epistles. However, based on external evidence, Pauline authorship is favoured. The church has traditionally ascribed Paul the authorship of the epistle. Barnabas, Tertullian, Clement all knew about the epistle and its association with Paul. Internal evidence also suggest that Paul write the epistle. Its opening greetings indicate that Paul wrote the epistle.

Dating the epistle may have to depend on the acceptance of either Pauline authorship or not. Since we accept it as having come from Paul, and also during his imprisonment, the epistle may have been written between 63 to 67 AD (Brown, 2014). The general consensus is that these epistles were written during Paul's imprisonment at Rome (cf. Ac 28:16, 30-31). If such is truly the case, then Paul wrote Colossians around 61-63 A.D. from Rome. The indication is that the epistles to the Colossians, Philemon and the Ephesians were carried to their destination by Tychicus and Onesimus (cf. 4:7-9; Phile. 10-12; Eph. 6:21-22).

Purpose of Writing: There seems to be a consensus between (Brown, 2014; Horgan, 2014; Copeland, 2001) on what necessitated writing of Colossians. These Scholars assert that what led to the writing of Colossians was the arrival Ephaphras in Rome with not-too-good news about the heresy going on in the church of Colossae. This heresy, of course, was Gnosticism which was a problem to many churches in eastern Roman Empire. The purpose of writing the epistle may include the need for Paul to express personal interest in the church at Colosse. Again, it may have been to warn against a reversion to their old pagan ways of life (cf. 1:21-23; 2:6; 3:5-11). Also, the possibility of refuting the Colossian heresy may have been part of the purpose of writing the letter.

2. Exegetical Study of Colossians 1:16-17

The most basic of all scientific principles is implied in these two verses (Colossians 1:16-17) that is, the principle of conservation of mass/energy, or “all things” according to this principle, nothing is now being either created or annihilated—only conserved, as far as quantity is concerned.

2.1 Context of Colossians 1:16-17

David Naugle (2015:2) observes that in this epistle, Paul is concerned to critique and cancel out a heresy to which the Colossian Christians had yielded. This heresy was of Jewish, Essene or Gnostic origin, and it focused on the spirit world and the worship of spiritual powers and angels instead of the cosmic Christ. Hence, the book of Colossians presents a cosmic Christ who is not only invisible but is concerned with the cosmos.

Exegesis of Verse 16 and 17

Verse 16 "For in him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things have been created through him and for him. 17 He is before all things, and in him all things hold together." 16a) all things have been created through him and for him.

Michael J. Kruger (2016) avers that the "all things created" include even the cosmic powers that the opponents at Colossae proclaim as all-powerful forces ruling the world. Gerhard Krodel (1994:34) posits that these cosmic powers cannot, therefore, be superior to Christ. He is the Word by which God made, upholds, and rules creation unlike the thought of Arius that Jesus was a creature just that He was higher than normal human beings. Paul counters that idea by stating categorically that all things have been created through Jesus and for Him. They belong to him, meaning he owns them. William Barclay (1975) asserts that He was not just the agent of creation but was also the goal of creation. That is to say, creation was created to be his and, worshipping Him is not a misnomer.
Verse 16b"…and He is before all things, and in Him, all things consist."

H. D. M. Spence and Joseph S.Exell (2011:12) opine that other things are loose and happen to be consolidated somewhere hence, it is the Divine Word by which they are tied.John McRay (2003:np) observes that Paul does not say He was before all things but he uses *ἐστιν* a verb in the indicative present active 3rd person singular from *εἰμί* depicting the "presentness" of what he is saying. Christ is before all things, be it the ones in eternity past or still to come. He is before all things. That is to say time does not change that reality. This is a depiction that can only be given to God. Meaning the Cosmic Christ existed as pre-incarnate with God the Father, left that place, and came to earth as a human being in his incarnation. In other words, His coming to earth was not His beginning. He had been and always was. William Loader (2017:147) posits that He came from the Father and did not just appear on earth from nowhere. His source is the Father because out of him, he proceeds. Paul uses the word *συνέστηκεν* to describe the relationship Jesus has with all things. Peter Gorday and Thomas (2000:15) claims that all of creation stand with him, meaning apart from him, nothing can survive by itself. The phrase "all things" includes the various supernatural powers specified in the verse's remaining part.

2.2 Verse 17: he is the image of the invisible God, the firstborn of all creation.

Thomas Hale (1996) avers that the word image is the Word *εἰκὼν*, which also means likeness. Since man cannot see God with their optical eyes, by looking at Jesus, the character and qualities of God are seen, for Heis God's one true incarnation. God the Father is not visible to the optical eyes, for no man can see him and live. When Thomas asked Jesus to show them the Father, he asked them if he had been with them all these times, and they still did not understand. If they have seen him, they have already seen the Father. Tokunboh Adeyemo (2006) argues that in African Traditional religions, God the creator is distant, but he is also invisible; hence there is a need for intermediaries between him and human beings. Paul thus presents Christ Jesus as that very image of God. The One going to the Father is through him, for he is the way, the truth, and the Life for no one come to the Father but by Him (John 14:6).This points out that using any intermediary apart from Jesus can never take one to the Father. The word "image" implies that the Son shares the same substance as God the Father. It means Christ shares the same substance as God. What makes God; He is the same substance that makes Christ.

From the above verses we could deduce that God did not want to be distant from His creation. In other words, God cares about the physical realm. Therefore, the church which is the body of Christ has a great role to play as it regard substance and care of the environment.

3. Concept of Environmental Sustainability

In order to understand the concept "environmental sustainability" it is important to define first, the terms "environment" and "sustainability." Isife (2012:24) avers that environment can be conceptualised as all physical, non-physical, external, living and non-living situations surrounding an organism that determine its existence, development and survival at a particular time. It encompasses constantly interacting sets of physical (natural and man-made) elements and non-physical, living and non-living (e.g. social, cultural, religious, political, economic) systems, which determine the characteristic features, growth and sustainability of both the component elements of the environment and the environment itself (Muoghalu, 2004).In relation to the environment, Boamah (2015:15) defines the term "sustainability' as the process of ensuring a healthy natural environment – clean water, air and land as well as the protection of animal species.

From the above, it is clear that environmental sustainability relates to the ability of the ecological, economic and socio-cultural systems in a manner that does not limit the possibility of meeting the present and future needs of the various components and aspects of the environment. Environmental sustainability simply put; is the process by which human and non-human activity on the environment is geared towards improving human living standards and protecting/preserving the environment (Igbudu, &Amadi, 2018: 17). It is the mutual and responsible interaction with the environment to the degree of which there is no depletion or degradation of its natural resources and maintenance and preservation of the quality of the environment. This also has to do with the maintenance and preservation of those agents: actors and factors that account for environmental sustainability (Njar & Enagu, 2019:45). Environmental sustainability entails consciousness, an attitude, behaviour or character approach towards the self and one's environment (Adebimpe & Kayode, 2018). It takes cognizance of population, sustainable yield, sustainable waste disposal, and competitive development and industrialization. Ugboma (2015:52) averred that environmental sustainability allows for the needs of man to be met without jeopardizing the ability of future generations to meet their needs. More so, it is the responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. Also, Agunwamba (1998:2227: cited in Njar & Enagu, 2019:45) asserts that the practice of environmental sustainability helps to ensure that needs of today's population are met without jeopardizing the ability of future generations to meet their need.

On the whole, environmental sustainability is an effort to preserve and maintain the ecosystem vis-a-vis proffering and promoting modalities through which human living beings can enjoy a better malicious co-existence. Environmental sustainability takes cognizance of the health of the eco-system in the long run and aims at protecting and preserving the eco-system.

4. Colossians 1:16-17 and Environmental Sustainability

Some people see Christian faith as something completely internal and spiritual. They classify Christianity as a religion which is solely concerned about their eternal salvation and their self-care. However, Christianity is not only limited to the spiritual but also the physical or cosmos is also a concern to God. The text under study proves that God is the creator of the heaven and the earth. In fact, Genesis 1:26-27 clearly reveal that man was created in the image and likeness of God and then given the responsibility to take care of the earth (Genesis 2:15). In other words, the earth is the responsibility of man to sustain because in man is embedded the intellectual capacity to preserve the earth. The things in heaven (the invisible realm) are sustained by God directly without the involvement of man. But the things on earth and visible are to be sustained by man.

The two most powerful forces ruling our world today are science and religion. Both attempts to explain our reality as humans as well as shape decision making in our everyday lives. Due to inconsistencies, mainly biological topics, the two have been separated as contradicting beliefs in other fields. However, one of history's most awarded scientists was very vocal about the entwinement of the two. In 1940, Albert Einstein declared "science without religion is lame; religion without science is blind" (Einstein, 1940). Einstein is arguing that the two subjects do not make sense without the other. Continuing to keep the two separated may be prohibiting further progress to our world's greatest issues. Currently environmental issues are growing worldwide, and are only expected to get worse. Clean air, resource availability, and bio-diversity are all decreasing. Despite an increased number of terrestrial and marine protected areas and their overall land coverage, bio-diversity continues to drop rapidly (IUCN and UNEP, 2012). Researchers propose the lack of progress on successful conservation is due to efforts focusing on technical solutions as opposed to resolutions that relate to people's vision and values (Vucetich, 2010). A new strategy is needed to inflict urgency of environmental protection that can relate to any person's principles no matter their walk of life. For this reason, it is necessary to evaluate the legitimacy of religion as a possible motivation and tool to promote environmental conservation

Climate change has become a global discussion in recent times especially in United Nations' meetings. It has been ascertained that human activities in the environment grossly impact climate change (Mahmoud & Gan, 2018). Without doubt, human activities help to advance or destroy the environment. For Christians life should not be only about eternal salvation but preserving what God has created because the Spirit of Christ dwells in our hearts (Romans 8:9). Undoubtedly, Jesus is not physically present with us to sustain the environment directly, but He has the church which is His physical representation on the earth. Christian perspective should embrace all of life.

According to Ladam (2012) Christianity is a belief about what life is all about. It is not just about what is within us; it is about what is all around us. Our environment constitutes all that is around us; and as important as we hopefully wait for our heavenly home, we should keep our earthly home in other. Craig (2012) further observes that through the gospel of John 1:3 it is evident that through Christ all things were made that have been made. This implies that Christ is the savior of all. Christ is not only found within. He is found all around.

In Nigeria, the discussion on environmental sustainability has also attracted scholarship with a lot of attention focusing on environmental protection. It is so because Nigeria as a nation has become more at alert to the issues after the incidence of the flood disasters that took place especially between 2011 and 2014 leading to loss of human lives, huge socio-economic losses (worth over US$9.5 billion), and environmental impacts capable of threat to food security. It has also been agreed among scholars in Nigeria that human activities against the environment are grossly responsible for the monumental flood the nation experienced in 2011 and 2012 (Ottuh, 2018:69). One of the major problems apart from the rise of water levels from the rivers that affected coastal areas and collapse of drainages, blockage of drainages by refuse was responsible for the flood disaster. The blockage was a result of indiscriminate refuse disposals into drainages or other water channels by residents. Even in many Christian dominated environments one could see how the environment is less of a concern to many. Any Christianity that does not promote the sustainability of the environment is half-Christianity. In the gospel, when the storm arose as a threat which could lead to loss of lives and even properties, Jesus stilled the storm (Mark 4:35-41). The stilling of the storm is not just a display of the authority of Jesus but a show of concern for the environment.

Clearly a crisis of dilapidation is enveloping Gods creation especially in Nigeria. Environmental destruction includes the transformation of forest and field into concrete and pavement, the extinction of entire species, the alteration of earth's energy exchange systems and toxification and pollution of the atmosphere, land, and water systems of the world. Goerge Scott (2021) cites Ecumenical Patriarchs Bartholomew (2010) who states:

We must treat nature with the same awe and wonder that we reserve for human beings. And we do not need this insight in other to believe in God or to prove his existence. We need it to breath; we need it for us simply to be.

In a sermon from 1789, John Wesley attempted to proffer an answer to the question "why has Christianity done so little good to the world?" this question remains relevant even till this day. According to Rebecca Copeland (2018), in her article, *Christianity can be Good for the environment,* observes that numerous studies of Christian Communities and individuals from the last 50 years show negative correlations between Christianity and environmental protective beliefs and behaviours. She further state that in 2013, a study found that Christians reported lower levels of environmental concern than non-Christians.

5. The Role of Christians in Environmental Sustainability

Taylor Allen (2018) observes that in order for environmental sustainability to be effective it must have a method of translating to people's everyday values. Developing countries which include mostly bio-diversity hotspot areas are important to maintain sustainable development. Due to most of these countries following an organized religion, predominantly Christian, an alternative method of conservation may be successful to motivate citizens to participate in efforts. In order for this to be successful, members of the congregation must agree that there is a religious obligation to care for the environment.

Cyprain Alokwu (2017) aver that it is erroneous to believe that information and education is all that is needed to provide solution to the environmental crisis and achieve ecological sustainability; and that awareness is not sufficient to global actors and spectators on the global environmental crisis. He further claims that the environmental crisis has to be viewed from moral and ethical perspective. Failure to comprehend the problem from moral and ethical dimensions is a sign and indication that the values underlying our dominant cultural and economic practices have become bankrupt. According to Conradie (2008), the problem lies not outside but inside us, not in the ecosystem but in the human heart, in the collective psyche. Hence Christians have a part to play in sustaining the environment.

The fundamental standpoint for church's engagement in the environment emanates from its belief that God created and loves His world. He values and cares for it independently of human existence. By this very fact, it is expected that human beings, bearing the image of God (particularly Christians) and as an integral part of that creation, should imitate the concern of God for maintaining and taking care of the earth (Robert and Spencer, 2007:75). In imitating this loving and caring

attitude of God, humans are expected to live in a wholesome relationship with the rest of creation so as not to cause such destruction that species, ecosystems and indeed large numbers of people are threatened. In this regard, Steve de Gruchy (2004) cautiously notes that we cannot just commodify the environment, but are obliged to respect its integrity and honour its creator and owner. Unfortunately, people's non-appreciation of the environment, which is based on a very strong anthropocentric attitude towards nature, is to a very large extent the cause of the current environment and poverty problems.

The mandate to exercise dominion over the rest of the creation should not be seen as a warrant for supremacy and exploitation that it has so often been taken to imply. Rather, God intends that man should have a relationship with his environment. The role of Christians to the environment is in complete stewardship of the environment as Gods creation. Undoubtedly, man's activates has a direct impact not only on the environment in terms of the concrete environment but also impacts man as well. Local churches should be very involved not in preaching only but in participating in the care of the community. The biblical understanding of stewardship implies accountability and participation. To move beyond guilt and powerlessness, we need to move from mastery, control and ownership attitudes to an attitude of stewardship toward all of life. This means becoming caretakers of creation with a sense of identification and partnership, rather than dominion and exploitation. To be a steward of creation is to embrace the world, to love as Christ did, and to be willing to sacrifice for the world rather than escape from the world (Johnson, 2000).

One example of a successful use of Christianity for conservation is in Lebanon, where the Advocates for Religious Conservation (ARC) teamed with local government to encourage the Mennonite Church to protect their surrounding forest. Since 2000, the church has not only succeeded in protecting the forest, but two additional forests as well. They are responsible for developing environmental education programs in over 70 surrounding villages, and play a major role on conservation in Lebanon (Mcleod, 2015). It could be said that caring and sustaining the environment is an act of love for creation and a proof of honour to God as the creator of all things both invisible and visible.

6. Conclusion

Man is not separate from his environment just as God is not separate from His Creation. From Colossians 1:16-17 we see Christ who is the image of God as the reason and cause of all creation both things visible and invisible. He is interested in holding all things together. However, Jesus Christ is not physically present but is ascended to heaven after His resurrection. Nevertheless, the church which is His body is the physical representative of Christ. Therefore, Christians are not to be only spiritually and heavenly minded but as well earthly conscious and relevant to the sustainability of the physical environment. This paper concludes that the church has a responsibility and part to play as far as the preservation of our earthly environment is concerned.

7. Recommendations

The following recommendations are hereby made:

There is need for construction of theological teachings on the care for the environment amongst Christians. Hence, Christian preachers should emphasize the need for active Christian involvement in environmental care.

In imitating this loving and caring attitude of God, Christians in Nigeria are expected to live in a wholesome relationship with the rest of creation.

Christian associations that deal specifically with environmental sustainability should be developed and encouraged.

Christians should be aware as to where science and religion converge for the sustainability of the environment.

More adequate environmental laws should be formulated and passed as public policy to ensure fair management of the environment. Scholars of religions as well as religion leaders and laity should take part in the articulation process of the stipulation

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Leveraging Artificial Intelligence for Enhanced Administrators Decision Making in Educational Institutions: A Comprehensive Exploration of Applications, Challenges, and Opportunities

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Abstract. The role of Artificial Intelligence (AI) as a powerful tool for enhancing decision-making in educational institutions has been examined. This paper provides a detailed insight into the exploration of the applications, challenges, and opportunities inherent with leveraging AI for improved decision-making in educational institutions. The paper draws on existing research and current trends, to examine the different applications of AI in education. This includes but not limited to personalized learning, predictive analytics, and administrative optimization. The challenges and ethical considerations associated with the use of AI adoption, such as algorithmic bias, data privacy, and transparency were highlighted. Despite these challenges, the paper identifies numerous opportunities for educational stakeholders to harness the transformative potential of AI to improve teaching, learning, and administrative processes. Recommendations are provided for policymakers, educators, and stakeholders to adopt AI as a catalyst for innovation and enhanced educational decision-making. The paper concluded that by prioritizing responsible AI use, through fostering interdisciplinary collaboration, promoting equity and inclusion, educational institutions can open the doors to the full benefits of the transformative potentials of AI to improve decision-making and foster educational equity.

1. Introduction

Artificial intelligence (AI) technologies have revolutionised many facets of life in the last several years, and education is no different. According to Alam, (2021) educational institutions are increasingly utilising AI to improve decision-making, expedite administrative duties, customise instruction, and increase overall productivity. It's becoming increasingly clear that AI has the power to fundamentally alter educational methods and outcomes as it develops. The purpose of this study is to present a thorough analysis of the advantages, disadvantages, and applications of applying AI to improve decision-making in educational settings.

There are a number of possible advantages to using AI technologies in educational contexts. Large data sets can be examined by AI-driven analytics systems to identify trends in student performance, learning, and future growth. Nadarzynski et al. (2022) stated that chatbots and virtual assistants powered by artificial intelligence (AI) can increase administrative productivity through task automation, prompt staff and student assistance, and community participation. To maximise learning outcomes, AI-based adaptive learning systems may also customise lessons to meet the unique needs and learning preferences of each learner.

When utilising AI in the classroom, there are a few issues and problems in addition to these advantages. In line with this Naik et al.,(2022) asserts that to responsibly implement AI, considerations such as algorithmic bias, data privacy, and ethical implications must be thoroughly considered. Similarly, Vrontis et al., (2021) opined that if educators and other important

stakeholders are afraid of losing their employment or are not familiar with AI technologies, they can be reluctant to change. In order to ensure that AI benefits every student in the same way, it is necessary to address concerns about equity, accessibility, and the potential for educational gaps to widen even more. Despite these challenges, Artificial Intelligence has a great deal of potential to alter the way educational institutions make decisions. By leveraging AI to make better decisions, customise lessons, and distribute resources more effectively, educational leaders may better meet the needs of their personnel and students. The numerous applications of artificial intelligence (AI) in education, the barriers to its wider implementation, and the potential applications of AI to enhance decision-making in educational contexts were all explored in this study. This study aims to provide insights and recommendations to policymakers, educators, and stakeholders who wish to capitalise on AI's potential to enhance education.

Examining the many applications of Artificial Intelligence (AI) in educational decision-making is the aim of this study. Predictive analytics, administrative automation, adaptive assessment, and personalised learning are some of these uses. It provides an understanding of the intricate relationship that exists between artificial intelligence (AI) and the methods used in educational settings to make decisions. The challenges and ethical conundrums posed by its application in the classroom will also be covered in this Paper. This study aims to provide educators, administrators, legislators, and academics with essential insights into the revolutionary impact of artificial intelligence on the educational environment by examining the applications, challenges, and possibilities associated with this relationship.

The study is guided by the theory of technological determinism which offers insight into how AI might be used in educational institutions to improve decision-making. According to this theory, societal processes and structures, including educational institutions, are shaped and influenced by technological advancements like artificial intelligence (AI). (Bozkurt et al., 2021). Technological determinism holds that incorporating AI platforms and tools will create new avenues for development and expansion, fundamentally changing the way administrative decision-making is done in educational institutions.

2. Conceptual Overview

2.1 Artificial Intelligence (AI) and Its Relevance in Educational Contexts

Artificial Intelligence (AI) is the term used to describe computer systems that simulate human intelligence processes (Hwang et al., 2019). These processes include reasoning (using rules to arrive at approximations or firm conclusions), self-correction, and learning (acquiring knowledge and rules for applying it). According to Luckin,(2019) by utilizing technology to improve several facets of education, Artificial Intelligence (AI) significantly contributes to the transformation of traditional teaching and learning methods in educational situations. AI is relevant in educational settings because technology can analyze large volumes of data, personalize learning experiences, and automate administrative work

Artificial intelligence (AI) is redefining education by providing creative answers to enduring problems and changing how teachers instruct, students learn, and educational institutions function (Khan, 2022). This sheds light on the potential benefits and revolutionary potential of Artificial Intelligence (AI) in education, providing an overview of the technology's increasing use in the subject.

According to Almohammadi (2013), AI-powered adaptive learning solutions analyze student data and behavior to provide personalized learning experiences tailored to each learner's needs and learning preferences. Intelligent tutoring solutions enhance student motivation, engagement, and academic accomplishment by offering real-time feedback, remediation, and personalized course sequencing. Artificial intelligence (AI)-driven teaching software that modifies content and speed according to student competence levels promotes deeper comprehension and improved idea retention.

Artificial intelligence (AI) algorithms examine vast amounts of educational data, including student performance, behavior, and attendance, to identify trends, patterns, and insights. Teachers can anticipate student performance, identify students who may be at danger, and take prompt action to provide targeted support and interventions by utilizing predictive analytics. With the use of AI-powered dashboards and decision support systems, school administrators may improve educational outcomes, allocate resources optimally, and make data-driven decisions. Similarly, AI-powered chatbots and virtual teaching assistants provide teachers and students with round-the-clock support by answering questions, providing feedback, and promoting learning. Virtual tutors employ machine learning and natural language processing (NLP) to clarify topics, encourage study outside of the classroom, and involve students in interactive dialogue. By handling administrative tasks like

scheduling, grading, and course management, chatbots assist professors and free up their time to engage students more deeply.

Additionally, Xia et al., (2022) stated that AI technologies support inclusive education by providing accommodations, adaptive tools, and accessible features for students with a range of learning demands. For students with disabilities, text-to-speech and voice recognition technologies make educational resources more accessible and make it easier for them to participate in class and finish assignments. Tools for captioning and translation driven by Artificial Intelligence (AI) facilitate multilingual education by enabling students to learn in the language of their choosing and promoting diversity and inclusivity among culture. It also relieves administrative burdens in educational institutions by automating repetitive tasks like scheduling, grading, and data entry. Intelligent virtual assistants improve operational efficiency and reduce administrative burden for school managers by assisting with tasks like student services, enrollment management, and admissions. The insights that AI-powered analytics and reporting tools provide into institutional performance, student outcomes, and resource usage enable strategic planning and well-informed decision-making.

Similarly Yu et al.,(2017) stated that the field of education is changing as a result of artificial intelligence, which provides creative ways to improve educational outcomes, promote inclusive and individualized learning, and improve teaching and learning. As AI advances pedagogy, curriculum design, and educational technology, it will become more and more important in education. Teachers and educational institutions must use AI-driven solutions in order to meet the diverse demands of students in the twenty-first century and prepare them for success in an increasingly AI-driven administrative process.

3. AI Technologies Commonly Used in Schools

3.1 Machine Learning (ML)

Machine learning techniques allow computers to learn from data and make decisions or predictions without the need for explicit programming. A few applications of machine learning in education are personalized learning, adaptive exams, and predictive analytics. Adaptive learning platforms that tailor instructional content to individual student needs, plagiarism detection tools that identify academic dishonesty in student work, and recommendation systems that provide resources or activities based on student preferences are just a few examples of how machine learning (ML) is being applied in education.

3.2 Natural Language Processing (NLP)

Natural language processing is an area of artificial intelligence study that looks at the relationship between computers and human language. NLP is used in classrooms to enhance communication, offer resources for language acquisition, and analyze and interpret text-based data.

NLP is used in classrooms by chatbots and virtual assistants who answer inquiries from students, provide feedback on their assignments, and aid with language learning. NLP is also used to fuel automated essay scoring systems that evaluate student work in accordance with predetermined norms.

3.3 Predictive Analytics

Data, machine learning methods, and statistical algorithms are used in predictive analytics to find trends and project results. Predictive analytics is used in education to evaluate student data, forecast academic achievement, spot at-risk kids, and suggest interventions to help them succeed. Through the analysis of past data on student behavior, attendance, and academic accomplishment, predictive analytics, for instance, can spot early indicators of academic disengagement or dropout risk. Teachers can use this information to find pupils who need help and then be proactive in meeting those students' needs.

4. Significance of AI in Educational Institutions in Facilitating Data Driven Decision-Making Processes and Improving Educational Outcomes

In the past several years, Artificial intelligence (AI) has upended traditional approaches to decision-making and brought innovative solutions to difficult problems in a number of industries (Dwivedi et al., 2021). According to Efthymiou, (2020) Artificial Intelligence has unparalleled potential to enhance administrative, teaching, and learning processes, as well as decision-making processes, in the educational sector. Artificial intelligence (AI) is very important for decision-making processes in educational institutions because it may improve student outcomes, optimize resource allocation, and foster a culture of data-driven decision making. The goal of this introduction is to emphasize these advantages. Artificial Intelligence (AI) is very important for decision-making processes in educational institutions because it may improve student outcomes, optimize resource allocation, and

foster a culture of data-driven decision making. The goal of this introduction is to emphasize these advantages.

There is ongoing demand on educational institutions to allocate resources wisely in order to satisfy the various needs of stakeholders, educators, and students (Khan, 2022). AI-powered predictive analytics can be used to examine large-scale data sets, including student demographics, academic achievement, and resource utilization, to identify patterns and trends that inform resource allocation decisions. With AI algorithms, school managers may optimize labor levels, program offerings, and budget allocations to improve student results while reducing waste and inefficiencies.

Fostering students' academic achievement and performance is the main goal of educational institutions. AI-powered predictive analytics can identify children who are academically at-risk, forecast student outcomes, and provide targeted interventions. Personalized learning systems powered by AI algorithms support deeper understanding and concept mastery by modifying the pace and substance of instruction to suit the needs of individual students. By leveraging AI technologies, educators may personalize their lesson plans, provide timely feedback, and create tailored learning experiences that optimize student engagement and academic outcomes.

Traditionally, institutional norms, anecdotal evidence, and intuition have all been used in educational institutions to make decisions (Vincent, 2021). Artificial intelligence (AI) helps the shift to data-driven decision making by providing insightful insights from real-time data analysis and predictive modeling. When educational leaders integrate AI-powered analytics tools into their operations, they can make decisions with confidence regarding curriculum development, program evaluation, and strategic planning.

Data-driven decision-making advances accountability, transparency, and continuous improvement for the benefit of educators, students, and the greater educational community.

According to Ruffle et al., (2019) opined that Artificial intelligence presents opportunities to improve student performance, distribute resources more effectively, and foster a culture of data-driven decision making, all of which have the potential to drastically alter how educational institutions make decisions.

AI technologies will play an ever-more-important role in education as they develop, influencing how teaching, learning, and administrative processes are carried out in the future. To effectively traverse the intricacies of the contemporary educational context and promote significant gains in academic performance and institutional efficacy, educational leaders must embrace AI-driven solutions (Bozkurt et al., 2021).

5. Implementation of AI-Driven Systems for Administrative Decision Making, such as Resource Allocation and Scheduling Optimization

5.1 Resource Allocation Optimization

Artificial intelligence (AI)-driven systems look at past data on program demand, student enrollment, and resource utilization in order to optimize resource allocation in educational institutions. Zhang et al., (2021) asserts that learning algorithms are able to identify inefficiencies in the use of resources, forecast future resource requirements, and recommend adjustments to optimize resource allocation. For example, AI-powered solutions are able to assess data on class sizes, course offers, and faculty availability in order to improve staffing assignments and scheduling in the classroom. This ensures efficient use of resources while meeting the demands of the students.

Scheduling Optimization

Algorithms utilizing artificial intelligence (AI) optimize scheduling processes by considering various factors such as course demand, faculty availability, room capacity, and student preferences. By utilizing machine learning approaches, automated scheduling systems create optimal schedules that minimize conflicts, optimize resource utilization, and accommodate user preferences. AI-driven scheduling solutions, for example, can evaluate student course preferences, academic prerequisites, and extracurricular activities to create personalized timetables that combine academic rigor with student interests and commitments.

6. Student Support Services, including Academic Advising and Mental Health Interventions

6.1 AI-Powered Academic Advising

AI-based academic advising systems provide personalized guidance and support to students by analyzing their academic records, career goals, and

interests. Natural language processing (NLP) algorithms enable virtual advising assistants to interact with students, answer questions, and provide tailored recommendations for course selection, career pathways, and academic planning. For example, AI-driven advising platforms can analyze student transcripts, test scores, and extracurricular activities to recommend courses, majors, and co-curricular opportunities aligned with students' interests and goals.

6.2 Mental Health Interventions

Artificial intelligence (AI) technology supports mental health interventions in schools by identifying symptoms of distress or mental health problems by analyzing student behavioral data, social interactions, and emotional cues. Natural language processing (NLP) algorithms can analyze oral or written student exchanges to look for indications of emotional distress, such as changes in tone, grammar, or mood. For instance, AI-driven chatbots or virtual counselors provide students with mental health concerns with immediate help, resources, and referrals; these services provide a convenient and discreet means of receiving assistance.

AI-driven systems offer innovative answers for administrative decision-making in educational institutions, such as scheduling and resource allocation optimization (Chen, 2020). Additionally, AI-powered technologies provide helpful student support services including personalised academic counseling and mental health services. By effectively deploying AI, schools can enhance their provision of student support services, boost operational efficiency, and promote the overall well-being and academic performance of all students.

7. Identification of Potential Challenges and Limitations Associated with AI Adoption in Educational Settings

7.1 Lack of Infrastructure and Resources

It’s probable that a large number of educational establishments lack the infrastructure, funding, and technological know-how required to effectively integrate and maintain AI technologies. A shortage of processing capacity, specific AI knowledge, and high-quality data may make it more challenging to apply AI in educational contexts.

7.2 Resistance to Change

According to Krishna et al., (2022) education professionals and administrators may be hesitant to use AI technologies because they fear losing their employment, losing their autonomy, and having their standard operating procedures and workflows changed. The need to overcome resistance to change and foster an inventive and experimental culture may be a substantial obstacle to the successful integration of artificial intelligence (AI) in education.

7.3 Complexity and Integration Issues

Integrating AI technology into the platforms, workflows, and educational systems that are now in use may be challenging and complex. When merging AI-powered solutions with software and legacy systems, issues with compatibility, interoperability, and technological limitations may arise.

7.4 Data Quality and Availability

AI algorithms need representative, diverse, and high-quality data in order to generate accurate forecasts and insights. Inadequate, unpredictable, or biased training data can compromise the precision and stability of AI systems and models (Sipior, 2020). Issues with Transparency, Algorithmic Bias, and Data Privacy in AI Decision-Making Systems

7.5 Algorithmic Bias

AI systems have the potential to reinforce or exacerbate biases in training data, leading to unjust or discriminating outcomes. Disparities in educational attainment may be exacerbated by biases based on socioeconomic class, gender, ethnicity, or other traits, which can result in unfair opportunities and treatment for students.

7.6 Data Privacy

AI systems gather, store, and analyze vast amounts of private student data, raising concerns about security and privacy. Unauthorized access, data breaches, and the use of student data for commercial purposes could endanger students' right to privacy.

7.7 Transparency and Accountability

AI decision-making algorithms and processes are opaque, which makes it difficult to comprehend, understand, and challenge the reasoning behind recommendations and decisions made by AI. If there is a lack of accountability and transparency, people

may start to doubt the impartiality, reliability, and accuracy of AI systems.

8. Strategies for Mitigating Challenges and Ensuring Responsible AI Use in Schools

8.1 Ethical Frameworks and Guidelines

Establishing moral guidelines, regulations, and best practices for the use of AI in education to ensure that these tools are developed, used, and handled responsibly. It is also important to promote transparency, equity, fairness, and accountability in the processes and outcomes of AI decision-making.

8.2 Data Governance and Privacy Policies.

Implementing robust data governance policies and privacy safeguards is necessary to safeguard student data privacy rights and lower the risk of data breaches and unauthorized access (Murdoch, 2021). Making certain that educational environments respect the relevant laws, guidelines, and industry standards for privacy and data protection.

8.3 Bias Detection and Mitigation

Using bias detection and mitigation techniques to detect and correct biases in AI algorithms and decision-making processes. Methodically assessing the equality, fairness, and accuracy of AI systems to lower the likelihood of discriminatory outcomes.

8.4 Educational and Training Programs

Teachers, administrators, and students should get training and education on AI ethics, privacy, and responsible use in order to raise awareness and promote responsible AI usage (Siau, 2020). providing participants with the resources they need to examine and assess the ethical implications of technology and AI decision-making in educational environments.

By proactively addressing these challenges and ethical concerns and putting safeguards for responsible AI use in place, educational institutions may fully embrace AI technology to improve teaching and learning outcomes while safeguarding student privacy, equity, and well-being.

9. Examination of Emerging Trends and Advancements in AI Technology Relevant to Educational Decision Making

9.1 Natural Language Processing (NLP) for Educational Insights

Artificial intelligence (AI) systems can already extract important insights from unstructured data, including student essays, forum postings, and teacher evaluations, thanks to emerging advances in natural language processing. In educational text data, natural language processing (NLP) algorithms may detect patterns, attitudes, and major themes. This allows educators and administrators to have useful information to help them make decisions (Shaik et al., 2021).

For instance, analytics solutions driven by natural language processing (NLP) can evaluate student writing samples to pinpoint problem areas, monitor changes in student engagement and mood over time, and evaluate the success of instructional interventions.

9.2 Explainable AI (XAI) for Transparent Decision Making

The goal of explainable AI (XAI) strategies is to improve the interpretability and transparency of AI decision-making, especially in complicated domains like education. Byrne, (2019) stated that XAI algorithms aid educators and administrators in comprehending the reasoning behind AI-driven insights by offering explanations or reasons for recommendations and judgments created by AI. XAI fosters confidence in AI technologies and makes it easier for educators to make well-informed decisions by raising accountability and transparency.

9.3 Federated Learning for Privacy-Preserving Data Analysis

Federated learning is a novel AI technique that eliminates the requirement for centralized data collection by enabling collaborative training of machine learning models over distributed datasets (Straw, 2020). Because federated learning allows different institutions to train AI models using their local data, it protects data security and privacy in educational situations.

By means of federated learning, academic institutions may uphold the rights of individuals to privacy and ownership of their data, all the while leveraging the collective intelligence of dispersed datasets to develop increasingly dependable and precise AI models for educational decision-making.

9.4 Adversarial Machine Learning for Robust AI Systems

Arbiteral machine learning is a rapidly developing field that aims to develop AI techniques and algorithms that are immune to manipulation and adversarial attacks.

By thwarting hostile actors' attempts to sway or undermine the recommendations and judgments rendered by artificial intelligence (AI), adversarial machine learning techniques offer the potential to enhance the security and resilience of AI systems in educational decision-making. By proactively identifying and mitigating vulnerabilities in AI systems, adversarial machine learning improves the integrity and dependability of AI technology used in education.

9.5 Human-Centric AI for Collaborative Decision Making

Human-centric AI strategies prioritize human values, preferences, and insights in AI-driven decision-making processes, fostering human-AI collaboration and co-creation. Teachers, administrators, and students can participate actively in the development, evaluation, and design of AI tools that are used in educational decision-making when human-centric AI approaches are applied. Human-centric AI combines domain knowledge and domain expertise with AI capabilities to provide inclusive, egalitarian, and successful decision-making in education (How et al., 2020).

There is a great deal of promise in new AI technology advancements to enhance educational decision-making. From explainable AI for transparent decision making and federated learning for privacy-preserving data analysis to natural language processing for pedagogical insights, these advancements provide innovative solutions to difficult problems in education. To this end, Adiguzel et al., (2023) stated that academic institutions may fully leverage artificial intelligence (AI) to improve teaching and learning results for each and every student by staying up to date with these new advances and using cutting-edge AI technology ethically.

10. Potential Long-Term Impacts of AI on the Role of Educators, Administrators, and Students in the Learning Ecosystem

Teachers may switch from being typical instructors to facilitators and mentors, using AI-powered tools to better track students' progress, provide individualized support, and customize education. For educators to improve their pedagogical abilities, AI literacy, and capacity to incorporate AI technologies into their lesson plans, they will require continual professional development and training. AI systems and educators will work together to co-design curricula, create instructional materials, and assess educational interventions. This, according to Straw, (2020) will promote a mutually beneficial partnership between human knowledge and AI capabilities.

Administrators will be able to make more informed and fact-based decisions by using AI-driven analytics to guide strategic planning, resource allocation, and policy creation. Administrators will have more time to concentrate on strategic projects and student support services as a result of AI technology' ability to automate repetitive jobs, optimize resource allocation, and streamline administrative operations. In order to ensure ethical AI use, protect student privacy, and ensure equity in AI-driven decision making, administrators will be essential.

AI-powered adaptive learning platforms and tutoring systems will enable students to receive individualized instruction based on their unique requirements, preferences, and learning styles (Kim, 2020). With the use of AI tools, students will be able to take more control over their education, setting objectives, monitoring their progress, and investigating individualized learning paths that match their aims and interests. As they work with AI technologies, students will gain the ability to think critically, be digitally literate, and be data literate, which will help them analyze and interpret data in a world that is driven by data.

11. Findings and Insights from the Exploration of AI and Decision Making in Schools

AI technologies have the ability to tailor education by evaluating data, modifying curriculum, and offering focused assistance to students. Educators and administrators may now make data-driven decisions about student support services, curriculum, instruction, and resource allocation thanks to AI-driven analytics. The use of AI in education brings with it difficulties and moral questions about algorithmic bias, data privacy, accountability, and transparency. To co-create effective AI solutions and encourage responsible AI use in education, interdisciplinary partnerships and collaborations between academics, educators, and policymakers are essential. In order to embrace AI as a revolutionary tool for improving educational decision making and

encouraging fairness, it is imperative that educators, administrators, and students have access to AI literacy, training, and resources.

12. Conclusion

The revolutionary potential of artificial intelligence (AI) in education must be acknowledged by educational stakeholders, who should then take proactive actions to leverage AI as a driver of innovation and enhancement in educational decision-making processes. This can be accomplished by investing in AI courses and training programs to assist educators, managers, and learners in becoming more adept at incorporating AI. It can also be achieved by enticing multidisciplinary groups to collaborate in order to jointly develop AI solutions that address urgent problems in education.

13. Recommendations for Policymakers, Educators, and Stakeholders to Embrace AI as a Transformative Tool for Enhancing Decision Making and Fostering Educational Equity;

To make sure that all parties have the abilities to use AI in education, policymakers should set aside funds and resources to promote AI education and training initiatives for instructors, administrators, and students. In order to create AI-powered solutions that serve a variety of educational needs and objectives, educators, administrators, researchers, and industry partners should work together and share best practices, resources, and lessons learned.

Prioritizing equity and inclusion in the adoption and application of AI can help policymakers and educators ensure that all children, regardless of background or circumstance, benefit from AI technology. They may do this by tackling biases, inequities, and access hurdles.

In order to promote openness, justice, accountability, and privacy protection in AI-driven decision making and interventions, policymakers should create moral norms and guidelines for the use of AI in education.

To determine best practices, evaluate the effects of AI on educational results, and handle new opportunities and difficulties in the application of AI, policymakers and stakeholders should fund research and assessment.

In order to effectively contribute to the development, assessment, and improvement of AI-driven educational tools and interventions, educators and students should be given the authority to co-create and co-design AI technologies.

Policymakers, educators, and stakeholders can fully utilize AI to generate positive change and innovation in education, ultimately increasing results for all learners, by embracing AI as a revolutionary tool for improving decision making and creating educational fairness.

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The Nexus between Agricultural Education Curriculum and Food Security in Nigeria: Challenges and Way Forward for Sustainable Practice

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Abstract. This essay investigates the connection between Nigerian food security and agricultural education curricula. The study explores the importance of incorporating agricultural education within the formal education system with an emphasis on Nigeria in order to address the urgent problems of food insecurity in the nation. It looks at how agricultural education can help people acquire the information, abilities, and mindset needed to increase agricultural output, support sustainable farming methods, and guarantee that every Nigerian has access to wholesome food. In addition to discussing policy implications and reform strategies aimed at strengthening the relationship between agricultural education and food security in Nigeria, the paper emphasises the significance of fostering innovation and entrepreneurship in the agricultural sector, promoting practical training and experiential learning, and aligning curriculum with industry needs. These strategies include investing in vocational and technical education, youth empowerment programmes, and agricultural extension services. The paper offers insights into how Nigeria might leverage the transformative potential of agricultural education to achieve food security, support rural development, and create a more resilient and sustainable food system by examining successful initiatives and best practices. Overall, the study emphasises how crucial agricultural education curricula are to tackling issues with food security and promoting agricultural growth in Nigeria.

Keywords: Agricultural Education, Food Security, Curriculum, Curriculum Integration, Sustainable Agriculture

1. Introduction

Nigeria, a nation blessed with abundant agricultural resources, is currently experiencing a paradigm shift in its agricultural education programme, which will profoundly affect the nation's capacity to achieve sustainable food security (Srivastava, 2020). Because this relationship addresses not just the urgent need to address nutritional needs but also the more general concerns of social justice, economic growth, and environmental sustainability, its significance cannot be overstated (Jordan et al., 2023). This study investigates the intricate connection between agricultural education curricula and Nigeria's food security in light of this. It examines how educational frameworks influence agricultural practices, what barriers prevent them from succeeding, and how to make this crucial connection stronger. This study analyses the current state of affairs, carefully considers empirical evidence, and draws lessons from other nations in an effort to shed light on the subtleties of this symbiotic connection and offer guidance for Nigeria's future. This essay is more than simply a thought exercise; it is a forceful call to action for communities, farmers, educators, and legislators to collaborate in building a solid framework that safeguards the nation's food sovereignty, gives people more power, and boosts productivity. The interaction between Nigeria's agricultural education curriculum and food security is one of the most significant intersections where policy, education, and agricultural practices come together to address one of the most pressing issues of our time. The subject matter at hand pertains to the intricate relationship between the knowledge imparted in educational institutions and the practical applications of that knowledge in the agricultural sector. This relationship ultimately

impacts the nation's ability to ensure a reliable, easily accessible, and healthful food supply for its populace.

In Nigeria, a country rich in agricultural resources and fast growing in population, achieving food security is not just a fantasy but a pressing requirement. But there are still a lot of barriers to overcome before this goal can be accomplished, including inefficient farming practices, inadequate infrastructure, limited access to resources, and a lack of skilled agricultural labourers (Babasanya et al., 2013). Despite these challenges, agricultural education is essential to revolutionising the sector because it equips stakeholders with the skills, knowledge, and innovative problem-solving strategies needed to overcome obstacles and increase productivity (Fernando, 2020).

The agricultural education curriculum raises and imparts critical knowledge and best practices to a new generation of farmers, agribusiness specialists, and legislators. Results related to food security are directly influenced by how well it can adapt to the shifting needs of the agriculture industry. This covers things like animal output, crop yields, market accessibility, and resilience to environmental shocks (Payumo et al., 2017).

However, there are various challenges and uncertainties in the connection between agricultural education and food security. It is challenging to carry out educational efforts intended to increase food security because of a variety of problems, including out-of-date curricula, institutional barriers, resource constraints, and restricted access to education in rural regions (Calixte et al., 2019). In addition, the rapidly evolving agricultural landscape is a consequence of consumer preferences, technology advancements, and climate change—all of which necessitate continuous innovation and adaptation within educational frameworks.

2. Importance of Agricultural Education Curriculum:

The curriculum for agricultural education is very important because it may be used as a catalyst to drive radical change in the agricultural industry. This can have a significant impact on how food security develops in Nigeria. Several significant elements highlight its significance:

Capacity Building: Agricultural education courses serve as the cornerstone for the skill development of those engaged in various aspects of the agricultural value chain, including farmers, extension agents, agribusiness specialists, and lawmakers. The programme equips stakeholders with the necessary knowledge, practical skills, and innovative approaches to address emerging concerns, enhance productivity, and adopt sustainable farming practices (Camillone et al., 2020).

Knowledge Transfer and Innovation: Research institutes with robust agricultural education curricula are better able to communicate information and technological innovations to farming communities. By staying up to date with the newest developments in agronomy, livestock management, agribusiness, and agricultural engineering, students and practitioners may leverage new insights and technologies to boost agricultural productivity, resilience, and profitability.

Promotion of Sustainable Practices: The promotion of sustainable farming practices that lessen environmental harm, protect natural resources, and increase ecosystem resilience depends on agricultural education curricula. The next generation of farmers is cultivated in schools through the integration of integrated pest control, soil conservation, agroecology, and water management into the curriculum (Schröder et al., 2019).

Empowerment and Poverty Alleviation: People, particularly those who reside in rural and 74arginalized communities, who have access to high-quality agricultural education are more empowered because it provides opportunities for economic self-reliance and upward mobility. The curriculum equips aspiring farmers and agribusiness entrepreneurs with the skills, knowledge, and resources they need, making it a powerful instrument for promoting social inclusion, rural development, and the eradication of poverty.

Resilience to Climate Change: A curriculum for agricultural education is essential to strengthening the resilience of farming systems and livelihoods in the face of climate change and variability. By including risk management techniques, climate-smart agriculture methods, and adaptation measures into the curriculum, educational establishments equip interested parties to deal with the difficulties brought on by extreme weather, changing precipitation patterns, and other aspects of climate change.

Food Security and Nutrition: The mental and physical development of children and other vulnerable groups depends on food security. By eradicating hunger and malnutrition, food security enhances quality of life, reduces mortality rates, and improves health outcomes. Perhaps the most important is the fact that agriculture education curricula directly help the accomplishment of food security and improved nutrition outcomes (Omachi et al., 2022) The curriculum promotes increased agricultural productivity, a variety of food production systems, and better market access in order to combat hunger,

malnutrition, and food insecurity. This aids in giving Nigeria's growing population a consistent and nourishing source of food.

3. The Current Status of Agricultural Education Curriculum in Nigeria

The agricultural education curriculum in Nigeria has a significant impact on the knowledge, skills, and attitudes of those employed in the agricultural industry, ranging from farmers and extension agents to agricultural scientists and policymakers. A detailed examination of Nigeria's current agricultural education plan reveals both its benefits and drawbacks:

3.1 Historical Context and Evolution

Nigeria has a long history of agricultural education that began with the establishment of agricultural colleges and institutes during the colonial era. The field of agricultural education has evolved over time due to the introduction of numerous organisations, courses, and initiatives aimed at increasing agricultural development and producing a skilled work force. However, problems including outdated curricula, subpar facilities, and limited access to educational opportunities still exist (Morris et al., 2021).

3.2 Institutional Framework

Numerous educational institutions, including polytechnics, universities, colleges of agriculture, and facilities for vocational training, are located in Nigeria and offer agricultural curricula. These organisations are crucial for offering agricultural education at all levels, from basic farmer training to cutting-edge research and academic degrees. To ensure the quality and relevance of agricultural education, the Nigerian government supervises and commands the Federal Ministry of Agriculture and Rural Development and the National Board for Technical Education.

3.3 Curriculum Content and Relevance

Even with efforts to 75odernize the curriculum, there are still significant gaps in the agricultural education curriculum's relevancy and alignment with contemporary agricultural methods, technological advancements, and market demands. Many academic curricula still prioritise theory over practical skills, depriving students of the hands-on learning and technical expertise required for success in the workplace. Additionally, the curriculum usually overlooks innovative areas like as agribusiness, climate-smart agriculture, and value chain management, which restricts graduates' ability to tackle new challenges and seize possibilities in the agricultural sector (Fernando, 2020).

3.4 Infrastructure and Resources

The quality of agricultural education in Nigeria is restricted by a lack of infrastructure and resources, including demonstration farms, lab spaces, and instructional materials. It is challenging for many educational institutions to secure funding, materials, and qualified teachers, which makes it difficult for them to offer top-notch training and instruction. These resource limitations must be addressed if agricultural education in Nigeria is to become more effective and competitive.

3.5 Partnerships and Collaboration

Collaboration between academic institutions, governmental agencies, corporate sector partners, and international organisations is essential to enhancing agricultural education in Nigeria. In order to improve faculty development, curriculum creation, and student learning, partnerships enable institutions to use outside expertise and support through information exchange, resource 75obilization, and capacity building.

3.6 Inclusivity and Access

In remote and marginalised communities, where access to agricultural education is still limited, there is an especially pressing demand for trained agricultural experts. Gender disparities persist, as women are disproportionately underrepresented in agricultural education courses and extension activities. It is critical to address barriers to access, such as budgetary constraints, geographic isolation, and cultural norms, in order to guarantee that all prospective farmers and agribusiness professionals have the opportunity to gain from agricultural education (Ezhim et al., 2019).

The Link between Agricultural Education and Food Security in Nigeria Agricultural education plays a vital role in providing a link between skill training, knowledge gain, and sustainable farming practices in Nigeria's pursuit of food security. This partnership is crucial to resolving the intricate problems affecting Nigeria's food system and 75ealizing the country's agricultural potential. A few significant elements highlight the intricate connection between food security and agricultural education:

3.7 Capacity Building and Skill Development

Agricultural education equips people with the technical know-how, data, and abilities needed to increase agricultural productivity, adopt sustainable farming practices, and get around production barriers, from farmers to agricultural scientists. Stakeholders may increase crop yields, maximise resource 76tilization, and diversify production systems through educational programmes that provide training in agronomy, livestock management, agribusiness, and agricultural engineering. This will ultimately increase food availability and security (Obaniyi, 2021).

3.8 Innovation and Technology Adoption

The agriculture sector is encouraged to innovate and embrace new technologies by agricultural education. This enables stakeholders to gain productivity, flexibility, and competitiveness by utilising advancements in biotechnology, digital technologies, and agricultural research. By integrating state-of-the-art research findings and practical applications into their curricula, educational institutions promote the adoption of precision farming, climate-smart agriculture, and value-added processing techniques. This promotes agricultural change and enhances the results for food security (Oyawole et al., 2020).

3.9 Sustainable Agriculture Practices

Agriculture education promotes the adoption of sustainable agriculture methods, which reduce environmental harm, protect natural resources, and strengthen ecosystem resilience. Programmes that convey knowledge of agroecology, soil conservation, water management, and integrated pest management help farmers develop a culture of environmental care. This encourages sustainability over the long run and guarantees that food production systems continue to be robust in the face of environmental problems like climate change (Rolando et al., 2017).

3.10 Market Access and Value Chain Development

Agricultural education helps farmers connect their output to markets, take advantage of value-added opportunities, and increase revenue. It also facilitates the creation of value chains and market access. Education institutions provide training in value chain management, post-harvest handling, and market analysis, which helps farmers become more resilient to food security and economically viable. This gives farmers the ability to find new markets, raise the calibre of their output, and bargain for lower prices.

3.11 Policy Advocacy and Governance Reform

The policy advocacy and governance reform initiatives that aim to address institutional constraints, structural obstacles, and policy gaps that obstruct agricultural development and food security include agricultural education. By fostering critical thinking, research skills, and policy analysis abilities, educational institutions empower stakeholders to participate in evidence-based policymaking, support pro-poor agricultural policies, and support inclusive agricultural transformation agendas that prioritise the needs of smallholder farmers and vulnerable communities (Obaniyi, 2021).

4. Challenges Faced in Achieving Food Security in Nigeria

Nigeria has a lot of promise for agriculture, but there are now a lot of barriers in the way, making it hard for the country to feed its growing population. These intricate concerns cover a wide range of distribution, production, administration, and accessibility aspects of agriculture. For a variety of factors, including the nation's reliance on old farming methods, its limited access to modern inputs and technologies, its poor management of soil fertility, and its dearth of extension services, Nigeria's agricultural output remains below potential. Low productivity makes it more difficult to produce enough food to meet the demands of a rapidly growing population, which exacerbates food insecurity (Donkor et al., 2019). Climate change poses a severe threat to Nigeria's agricultural output since it causes crop yields to decrease and farming operations to be disrupted by rising temperatures, erratic rainfall patterns, and extreme weather events. Deforestation, soil erosion, and biodiversity loss are examples of environmental degradation that worsens food insecurity in susceptible places. The resilience and viability of agriculture are further threatened by these issues.

Land fragmentation, shaky land tenure, and land rights disputes limit smallholder farmers' access to fertile land, which hinders agricultural output and growth. Similar to this, competition for water resources, poor irrigation methods, and water scarcity exacerbate production challenges, particularly in semi-arid regions with significant rainfall fluctuation (Alpízar, 2020). Nigeria's agricultural value chain is hampered by inadequate infrastructure, which includes poor road networks, a lack of storage facilities, and inefficient transportation systems. As a result, a lot of food is wasted or lost during the stages of harvesting, processing, storing, and transportation, increasing the possibility of shortages, price swings, and decreasing

food supply (Hammed, 2022). Rural poverty and a lack of resources like markets, loans, supplies, and extension services limit smallholder farmers' ability to invest in agricultural output, adopt modern technology, and get access to lucrative markets. Restricted access to financial institutions, market data, and agricultural extension services exacerbates poverty cycles and inequality, particularly for marginalised people (Bello, 2021).

In Nigeria, efforts to promote agricultural growth, attract private investment, and enhance food security are impeded by a lack of coherence in policy, inadequate regulatory frameworks, and institutional disarray. Successful agricultural policies and programmes are difficult to implement because of insufficient agency cooperation, policy contradictions, bureaucratic inefficiencies, and corruption. Food insecurity, relocation, and disturbances to agricultural activity are the results of ongoing hostilities. Farmer-herder skirmishes, tensions within communities, and insurgencies in some regions are a few instances of these conflicts. The presence of insecurity exacerbates food shortages and humanitarian crises in conflict-affected areas by impeding farmers' ability to cultivate their land, access markets, and engage in profitable activities (Olanrewaju, 2023).

While increasing public health and decreasing malnutrition require access to a range of nutrient-dense meals, food availability is a critical component of food security. In Nigeria, micronutrient deficiencies pose major health risks, particularly to women and children. This highlights the necessity of initiatives that promote a varied diet, nutrition instruction, and convenient access to goods enriched with nutrients. Nigeria's rapidly expanding metropolitan area and population strain agricultural resources, alter consumer behaviour, and raise food demand, all of which exacerbate the nation's food security issues. Urbanisation, which also results in land fragmentation, a decrease in the labour force employed in agriculture, and the loss of agricultural land to urban growth, erodes the nation's capacity to feed its population. Furthermore, food deserts, limited access to fresh produce, and rising food prices are common in metropolitan areas, all of which worsen food insecurity among disadvantaged groups residing in cities (Webb et al., 2016).

Despite its potential for agriculture, Nigeria still depends primarily on food imports to meet domestic demand for certain commodities like wheat, rice, and sugar. The country's reliance on imports puts food security and economic stability at risk since it leaves it vulnerable to fluctuations in external prices, unstable currencies, and disruptions in the supply chain. Addressing the root causes of import dependency—poor local production, inadequate processing capacity, and trade restrictions—is necessary to increase food self-sufficiency and reduce vulnerability to external shocks (Nnamani, 2023). Insufficient access to sanitary facilities, healthcare services, and clean drinking water can lead to foodborne diseases, malnourishment, and food insecurity in Nigeria. Weak food safety rules, contaminated water supplies, and inadequate hygiene measures pose serious health risks, particularly in rural areas and unofficial food markets. Addressing health and sanitation issues is necessary to increase food security, reduce the burden of disease, and improve nutritional results (Ikelegbe, 2013). The lack of awareness about nutrition, sustainable farming practices, and food safety among consumers, producers, and policymakers hinders the advancement of food security in Nigeria. To help people make informed decisions, pick nutritious foods, and support sustainable food systems, some examples of education and awareness-raising activities are public campaigns, farmer training programmes, and nutrition instruction in schools. Financing agricultural extension programmes and knowledge-sharing websites can also assist farmers in implementing best practices, raising productivity, and adjusting to changing climatic conditions.

Nigeria may experience changes in domestic food prices and availability as a result of its vulnerability to market volatility, commodity price fluctuations, and international trade dynamics. Nigeria's integration into international markets is the cause of this. External variables that have an impact on local food markets, such as trade laws, export prohibitions, and disruptions in the global supply chain, can make food insecurity and economic vulnerabilities worse. Reducing the impact of global market dynamics on Nigeria's food security requires strengthening local agricultural value chains, increasing export markets, and enhancing trade resilience (Fabinin, 2021). Inadequate processes for data collection, monitoring, and assessment prevent Nigeria from tracking food security indicators, assessing progress, or using data to support evidence-based decision-making. Accurate statistics on food production, consumption, prices, and nutritional outcomes are essential for identifying gaps, focusing interventions, and monitoring the performance of food security projects. Investments in data infrastructure, capacity building, and research collaboration can strengthen Nigeria's food security information systems and enhance its capacity to address emerging issues (Osabohien et al., 2018).

5. The Role of Agricultural Education in Promoting Sustainable Farming Practices and its Importance in Technical Skills and Knowledge Transfer

Since agricultural education gives farmers the technical know-how, tools, and knowledge they need to adopt profitable and sustainable food production methods, it is crucial to the advancement of sustainable farming approaches. This educational framework not only facilitates a better understanding of agricultural ecosystems but also equips individuals with the means to implement methods that optimise resource efficiency, minimise environmental impact, and enhance long-term agricultural sustainability. Several significant elements emphasise the role that agricultural education plays in promoting sustainable farming practices and facilitating the transfer of technical knowledge and skills:

Holistic Understanding of Agricultural Systems: Through agricultural education, students gain a thorough grasp of agricultural systems, including soil health, water management, biodiversity preservation, pest and disease control, and climate resilience. By introducing the ideas of agroecology, sustainable intensification, and ecosystem services into their curricula, educational institutions can aid students in understanding the interconnection of agricultural processes and ecosystems. This promotes a systems-thinking approach to farming among students, 78tilization sustainability and ecological balance (Pretty, 2018).

Practical Application and Experiential Learning: In order to help students develop technical proficiency and practical experience in farm management, crop production, livestock husbandry, and operating agricultural machinery, agricultural education places a significant focus on experiential learning and practical application. Educational programmes provide students with the chance to put their theoretical knowledge to use in practical settings through field training, farm internships, and demonstration plots. This fosters creativity and adaptation while helping students polish their problem-solving abilities and practical skills (Lopez-Ridaura et al., 2017).

Promotion of Sustainable Farming Practices: Agricultural education promotes the use of sustainable farming practices that maintain water resources, enhance soil health, use less chemicals, and protect biodiversity. Through the dissemination of information on techniques such as integrated pest management, crop rotation, agroforestry, conservation tillage, and organic farming, educational establishments empower farmers to mitigate their ecological footprint, decelerate climate change, and enhance their farming systems' resilience against severe weather events and other exigencies (PV, 2022).

Technology and Innovation Integration: Agricultural education enables farmers to maximise resource 78tilization, increase productivity, and enhance decision-making by employing digital tools, precision agriculture, and information technologies. It does this by integrating innovation and technology into farming operations. With the help of educational courses that teach skills like data analysis, GIS mapping, remote sensing, and farm automation, farmers may better adapt to the changing demands of modern agriculture and embrace cutting-edge technology.

Knowledge Transfer and Extension Services: Through agricultural education, knowledge transmission and extension services are made easier, giving rural people access to best practices, research findings, and technical expertise. Educational establishments employ outreach initiatives, farmer field schools, and extension programmes to establish a connection between research and practice. In the end, this increases farmers' resilience and productivity by enabling them to apply evidence-based solutions to agricultural difficulties, gather knowledge, and seek guidance (Camillone et al., 2020).

Capacity Building for Sustainable Development: Ultimately, improving farmers', extension agents', and other agricultural professionals' capacity to promote sustainable development goals including environmental preservation, food security, and poverty reduction depends on agricultural education. Education programmes foster a culture of innovation, lifelong learning, and continuous development, which helps individuals be adaptable in the face of change, take on new challenges, and contribute to agriculture being a more resilient and sustainable business (Ezhim et al., 2019).

6. Conclusion

This article discusses the connection between food security and Nigeria's agricultural education plan, which has significant implications for the country's agricultural growth, economic progress, and social welfare. In this discourse, we have talked about the importance of agricultural education in equipping people with the knowledge, skills, and attitudes necessary to address problems pertaining to food security. By integrating agricultural education into the formal education system, promoting sustainable

agriculture practices, empowering smallholder farmers, and fostering innovation and entrepreneurship in the agricultural sector, Nigeria can enhance its capacity to attain food security and promote rural development in the near future. To achieve these goals, collaboration between governmental bodies, educational institutions, civil society organisations, and other stakeholders is required. Policy changes are needed to enhance agricultural education, promote sustainable farming practices, and create an environment that supports innovation and entrepreneurship in the agricultural sector. Investments in youth empowerment programmes, agricultural extension services, and vocational and technical education are essential to boosting the productivity and resilience of the agricultural sector as well as the abilities of farmers and agribusiness professionals. Therefore, incorporating agricultural education into the curriculum is essential for addressing the nation's current food security concerns as well as laying the foundation for Nigeria's agriculture to be prosperous and sustainable in the long run. Nigeria can secure its food supply and contribute to global efforts to achieve food security by endorsing sustainable farming practices and providing financial assistance for agricultural education.

7. Recommendations

A deliberate strategy that considers key elements like stakeholder participation, hands-on training, teaching tactics, and curriculum design is required to improve agricultural education curricula. It is possible to improve the effectiveness of agriculture education curricula by implementing the following strategies:

Ensure that the curriculum is routinely evaluated and updated to take into account market demands, industry trends, and the most recent technological advancements. Talking with different industry players, including agribusinesses, research institutes, and farmers, can provide valuable insights into the skills required and the most recent opportunities in the agricultural sector.

Incorporate experiential learning opportunities such as field trips, practical exercises, and hands-on training into the curriculum to provide students with real-world experience and skills. Pupils who undergo hands-on instruction are more prepared to use their academic knowledge, hone their problem-solving skills, and prepare for careers in agriculture.

To enhance student learning and prepare them for the digital age, include technology, digital tools, and new teaching strategies into the curriculum. To introduce students to current market trends, include courses on data analytics, precision agriculture, agri-tech solutions, remote sensing, and other cutting-edge technology.

To encourage interdisciplinary learning, include subjects like agronomy, economics, environmental science, and business management in the curriculum. In addition to fostering critical thinking and preparing students for a range of occupations in agriculture and related fields, multidisciplinary teaching approaches assist students in gaining a thorough understanding of agricultural systems.

Partner with agricultural firms, educational establishments, and governmental agencies to provide students with opportunities for internships, work placements, and industry attachment. Through industrial experience, students can investigate career options, connect with experts, and pick up useful skills while taking part in innovation and development in the business.

Incorporate entrepreneurship, marketing, finance, and agribusiness management courses into the curriculum to provide students the skills they need to start and manage successful agricultural enterprises. By fostering creativity, taking calculated risks, and adding value to agriculture, entrepreneurship education boosts economic growth and job creation in rural communities.

To promote creativity and research, encourage student participation in conferences, contests, and research initiatives. Accessible research facilities, labs, and funding sources will promote student-led research projects and innovation in agriculture.

In order to promote industry-led projects and mentorship programmes, improve the curriculum, and welcome guest speakers, foster connections with international organisations, non-governmental organisations, governmental agencies, and industry players. Incorporating industry methods into the curriculum increases students' exposure to it, ensures its relevance, and creates opportunities for career and employment progression.

Establish mechanisms for monitoring and evaluating the curriculum's effectiveness while accounting for student performance, industry feedback, and graduate outcomes. Use assessment results to identify areas that require improvement, improve instructional

methodologies, and update the curriculum to reflect evolving academic and industry requirements.

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Navigating Ethical Quandaries in Nigerian Academia: A Conceptual Framework for Establishing Effective Research Ethics Boards and Ensuring Compliance

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Abstract. This study examines ethical issues in Nigerian higher education and offers a theoretical framework for setting up efficient research ethics committees and guaranteeing adherence. The first part of the study looks at the history of research ethics boards in Nigerian academia and their increasing necessity. In order to comprehend the significance of research ethics and pinpoint current frameworks for research ethics committees, a thorough literature analysis is carried out, with an emphasis on any shortcomings unique to Nigerian academia. A number of elements are included in the proposed conceptual framework, such as the definition and makeup of research ethics boards, the creation of mandates and scopes, the appointment and training of board members, the creation of ethical guidelines and policies, the application of ethical review procedures, and the cooperation with pertinent stakeholders. Furthermore, in order to improve the efficacy of research ethics boards, the framework highlights the significance of guaranteeing adherence to research ethics standards through awareness and education campaigns, ethical review procedures, ethical breach investigation and resolution, and regular evaluation. The discussion revolves around the potential consequences of putting the suggested conceptual framework into practice, which include improved research integrity, safeguarding research subjects, bolstering the reputation of the institution, fostering an ethical culture in research, improving research cooperation, and conformity to global norms. Many recommendations are made in light of the research and conclusions. These include cooperation with regulatory agencies, regular evaluation and improvement, networking and collaboration, institutional commitment, capacity building through training programmes, and awareness and education programmes. The importance of research ethics in Nigerian academia is emphasised in this study, which also offers a thorough conceptual framework for creating efficient research ethics boards. By putting this framework into reality, Nigerian universities would improve their standing in the eyes of the international academic community, improve research ethical procedures, and safeguard study participants.

Keywords: Research ethics, Academic integrity, Research ethics boards, Compliance, Nigerian academia, Ethical guidelines, Ethical review processes

1. Introduction

In many domains, innovation and knowledge development are based on academic research. However, in order to protect research participants and maintain the integrity of research findings, knowledge must be pursued within moral bounds (Sterling, 2017). A wide range of topics are covered by ethical considerations in academic research, such as responsible conduct, informed consent, privacy, data management, and conflicts of interest (Nycyk, 2021). The significance of research ethics in academia has gained recognition over time. To control research techniques and safeguard the welfare and rights of study participants, ethical frameworks and guidelines have been developed. These rules are especially important in disciplines like psychology, social sciences, and medicine because these subjects are frequently used in research (Mathur et al., 2019).

Research activities across a wide range of disciplines have significantly increased in Nigerian academia in recent years. The necessity for research ethics committees to guarantee the moral conduct of research

and safeguard the rights and welfare of study participants has increased as a result of this rise (Bowser, 2015). While there are still many colleges without research ethics boards, there are signs that certain universities in Nigeria have established research ethics boards—also known as research ethics committees—to supervise and control research operations (Koepsell et al., 2014). One positive step in encouraging ethical research methods is the establishment of research ethics boards in Nigerian universities. These boards are in charge of examining research ideas, determining any hazards, and making sure that experiments follow rules and ethical principles. They are essential in defending the welfare and rights of study participants (Zimmer, 2018). It is crucial to recognise that research ethics committees in Nigerian universities may differ in terms of their capabilities and efficacy. Their capacity to efficiently perform their duties may be impacted by elements including a lack of institutional support, insufficient board member training, and scarce resources (Head, 2019).

The purpose of this paper is to present a comprehensive conceptual framework that Nigerian institutions can use to establish effective research ethics committees. This framework's goals are to ensure that moral principles are followed and provide a structured approach to handling moral dilemmas. It explores the various institutional, sociological, and cultural factors that affect ethical dilemmas faced by academics in Nigeria. This conceptual framework is crucial because it can safeguard research participants, enhance the morality of research, and promote ethical research methods in Nigerian academic institutions. Furthermore, this framework can advance knowledge both inside and outside of Nigeria by fostering partnerships, attracting funding, and elevating the stature of Nigerian academics. Additionally, it serves as a guide for researchers, providing them with a comprehensive understanding of ethical norms and protocols, thereby ensuring the authenticity and importance of their work.

In the sections that follow, we'll look at relevant research ethics board frameworks, review the body of research ethics literature, and identify any inadequacies in the Nigerian academic system. Furthermore, we will discuss how to ensure that research ethics boards are followed, provide a case study that shows how research ethical boards were established at Nigerian universities, and present a comprehensive conceptual framework for the creation of effective research ethics boards. Finally, we will address the implications for future research and application and emphasise the significance of research ethics in Nigerian academia.

2. Literature Review

2.1 Understanding Research Ethics and Its Importance

Research ethics are the moral and ethical guidelines that govern how research is conducted. Among the variables are honesty, decency, and the proper use of information. It is crucial for academics to have a solid grasp of research ethics in order to ensure that research is conducted ethically and to protect the rights and wellbeing of study participants (Zimmer, 2018). Researchers can minimise potential harm and guarantee the welfare of study participants by adhering to ethical norms. Research ethics places a strong emphasis on the necessity of defending the rights, confidentiality, and dignity of study participants. This entails getting participants' informed consent, maintaining confidentiality, lowering hazards, and giving them the proper care (Mok et al., 2015). Research ethics ensures the validity and integrity of study results. In order to respect ethical norms, researchers must act impartially, transparently, and responsibly. By maintaining ethical standards, researchers can continue to add to the corpus of knowledge in their fields and maintain the trust of the general public and scientific community (Hayward et al., 2021).

Research ethics and the legal and regulatory frameworks that govern research activities are closely intertwined. Researchers must follow national and international regulations, such as the Helsinki Declaration, the Belmont Report, and Good Clinical Practice, depending on the nature of their study. Adhering to these guidelines ensures that research is conducted in an ethical manner and conforms with all relevant legal requirements (Yip et al., 2016).

In compliance with research ethics, researchers are required to handle and declare any potential conflicts of interest that might compromise the objectivity and integrity of their work. Open discussion of any financial, professional, or personal links that might influence the research's conclusions is necessary to maintain the study's credibility and objectivity (Zimmer, 2018). Research ethics promotes responsible behaviour and encourages ethical decision-making, honesty, and accountability throughout the study process. This includes appropriate data management, accurate reporting, responsible publication practices, and prudent use of research funds. Ethical research techniques improve the repeatability and dependability of research findings (Åstedt-Kurki, 2018).

2.2 Reviewing existing frameworks for research ethics boards

In evaluating the creation of research ethics boards at Nigerian universities, it is critical to review and modify well-established worldwide frameworks and norms that offer thorough direction on the moral conduct of research. In Nigerian academic institutions, these frameworks are an invaluable resource for creating and implementing research ethics boards.

2.3 The Belmont Report

The Belmont Report, a groundbreaking study on research ethics, was published in the United States in 1979. The National Commission for the Protection of Biomedical and Behavioural Research Subjects with Humans established it. The paper outlines three basic ethical precepts: beneficence, justice, and care for others (Ferdowsian et al., 2019). Assuring privacy and secrecy, getting informed permission, and safeguarding vulnerable groups are all part of the respect for persons principle. Researchers must optimise advantages and reduce damage to research participants in accordance with the beneficence principle. It entails determining the possible risks and benefits, weighing them, assuring participant wellbeing, and administering the proper treatment. The equitable sharing of the rewards and costs associated with research is emphasised by the justice principle. It mandates that researchers stay away from exploitation, make sure that everyone has equal access to research opportunities, and deal with concerns of inclusivity and justice (Mok et al., 2015).

2.4 The Declaration of Helsinki

The Declaration of Helsinki is a set of ethical standards for research involving human subjects that was developed by the World Medical Association. It provides guidance to researchers and medical professionals worldwide and has undergone multiple updates to account for evolving ethical norms. The Helsinki Declaration emphasises the need of obtaining informed permission from study subjects. It enumerates the requirements for disclosure of information, understanding by the participant, and voluntary engagement in order to obtain informed consent. The ethical review declaration emphasises the importance of independent ethical evaluation carried out by research ethics committees or institutional review boards. It emphasises how crucial it is that these boards assess the morality, the validity of scientific findings, and the potential benefits and drawbacks of various research methods (Cantín, 2018).

2.5 Participant Welfare

The statement places a strong emphasis on safeguarding study participants' safety, rights, and general wellbeing. It highlights how crucial it is for researchers to lower risks, provide appropriate medical care, and uphold confidentiality and privacy. The Good Clinical Practice (GCP) guidelines were developed by the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH). These guidelines mainly address the ethical conduct of clinical trials. The GCP guidelines offer a structured approach to organising and conducting clinical trials, emphasising the reduction of bias, preservation of scientific integrity, and openness. The requirement of informed consent—which ensures that study participants are completely aware of the objectives, techniques, potential risks, and rewards—is strongly emphasised in the recommendations. They also emphasise how important it is to protect participants' rights and autonomy throughout the experiment. The importance of participant confidentiality and data integrity is emphasised by the GCP guidelines (Ward et al., 2018).

2.6 National guidelines and regulations

Numerous nations have created their own national ethics norms and regulations. In Nigerian academia, these principles provide a crucial framework for research ethics boards. For example:

a. United Kingdom: In the UK, investigations involving human participants are supervised and ethical evaluations are carried out by the Research Ethics Service. The service, which operates under the authority of the Health Research Authority, ensures that research is conducted ethically and in compliance with both domestic and international laws (Chen, 2019).

b. United States: In the US, research ethics committees are governed by the Institutional Review Board (IRB) system. IRBs review and approve research methods in order to ensure compliance with ethical standards set out by regulatory bodies such as the FDA and the Office for Human Research Protections (OHRP).

c. Nigeria: The main organisation in charge of monitoring and governing research ethics in Nigeria is the National Health Research Ethics Committee (NHREC). For research involving human subjects, the NHREC offers ethical evaluation and approval,

guaranteeing compliance with national and international ethical standards (Tsan et al., 2020).
Institutional policies and guidelines

Academic institutions frequently create their own rules and regulations on research ethics. These institutional frameworks offer particular recommendations suited to the institution's setting in addition to national and international rules. Institutional regulations usually cover a range of topics related to research ethics, such as: Institutions specify the steps involved in conducting an ethical evaluation of research protocols, as well as the makeup and duties of research ethics committees and boards. This guarantees that research is thoroughly examined ethically. In order to get informed permission from study participants, institutions set criteria that outline the material that must be disclosed, the language to be used, and the procedures for guaranteeing understanding and willing involvement. Procedures for gathering, storing, and exchanging data are outlined in policies, guaranteeing participant privacy and data security. This covers protocols for data anonymization, safe storage, and controlled access to study materials. Institutions set up protocols to recognise and handle conflicts of interest between members of the research ethics board and researchers. This guarantees that the integrity and objectivity of studies are not compromised by any biases or vested interests (Mathur et al., 2019).

3. Conceptual Framework for Establishing Effective Research Ethics Boards

Table 1: Conceptual framework for effective implementation of research ethics boards in universities

Framework Component	Description	Indicators of Effectiveness and Compliance
A. Preliminary Considerations	- Clearly articulate the institution's commitment to promoting ethical research practices and protecting the rights and welfare of research participants. - Engage key stakeholders, such as researchers, ethicists, legal experts, community representatives, and institutional leaders, to gather input, establish shared understanding, and gain support for the establishment of the research ethics board (REB).	- Existence of a clear institutional policy promoting ethical research practices. - Demonstrated engagement of key stakeholders through consultation records and feedback mechanisms.
B. Structure and Composition	- Create a formal structure for the REB, including clear roles, responsibilities, and reporting mechanisms. - Ensure the REB includes members with diverse expertise, such as researchers from various disciplines, ethicists, legal experts, community representatives, and individuals with experience in research ethics. This diversity ensures a comprehensive and well-rounded assessment of ethical considerations.	- Documentation of the REB's formal structure, roles, and responsibilities. - Evidence of diverse expertise and representation within the REB membership. - Regular evaluation of membership composition to maintain diversity and expertise.
C. Development of Ethical Guidelines and Policies	- Develop guidelines and policies that align with national and international laws, regulations, and ethical standards applicable to research. - Cover key ethical considerations, including informed consent, privacy and confidentiality, risk assessment and mitigation, conflict of interest, data management and sharing, and protection of vulnerable populations. - Establish clear procedures for the submission, review, and approval of research proposals, including expedited and exempt review processes. Clearly outline the criteria for review and decision-making. - Ensure the guidelines and policies are easily accessible to researchers, written in clear language, and integrated into research ethics training programs. Communicate the guidelines effectively to all stakeholders.	- Availability and accessibility of written guidelines and policies for researchers and stakeholders. - Evidence of regular updates and revisions to guidelines to align with evolving ethical standards. - Methods of communication and dissemination of guidelines, such as websites, handbooks, and training sessions.
D. Implementation of Ethical Review Processes	- Develop clear guidelines and procedures for the review and approval of research proposals. Outline the steps, timelines, and requirements for each type of review process, ensuring consistency and efficiency while maintaining rigorous ethical standards. - Establish review committees with diverse expertise and provide training to ensure a comprehensive and informed assessment of ethical considerations. Committee members should possess the necessary knowledge and skills to evaluate research proposals effectively. - Evaluate proposals based on clear criteria and established ethical standards. Make decisions through consensus-based approaches to ensure fairness and transparency. Document the review process and decisions made.	- Documentation of standardized procedures for proposal review and approval. - Evidence of training and development programs for review committee members. - Transparency in decision-making, including documentation of rationale and communication of decisions to researchers.
E. Oversight and Monitoring Mechanisms	- Conduct ongoing reviews of approved research projects to ensure compliance with ethical guidelines and monitor the progress of research activities. - Perform internal audits and engage external experts periodically to assess compliance with ethical standards, identify areas for improvement, and provide impartial evaluations of the REB's operations.	- Documentation of regular reviews of approved research projects. - Evidence of internal and external audits conducted to assess compliance and identify areas for improvement.

	- Establish mechanisms for reporting ethical concerns, investigating violations, and implementing appropriate sanctions or disciplinary measures when necessary. Ensure accountability of researchers and the REB itself.	- Clear reporting mechanisms and evidence of actions taken on reported ethical concerns.
F. Collaboration with Relevant Stakeholders	- Foster collaboration, communication, and support to researchers and institutions to promote ethical conduct and compliance. Provide guidance and resources to facilitate ethical research practices. - Include community perspectives and engage with relevant communities in the ethical review process. Seek input, address concerns, and ensure transparency in research activities that may impact communities. - Align with national regulations and collaborate with other research ethics boards, professional associations, and international organizations to share best practices, exchange knowledge, and foster consistency in ethical standards.	- Demonstrated collaboration and support provided to researchers and institutions for ethical conduct and compliance. - Evidence of community engagement activities and integration of community perspectives in ethical review processes. - Documentation of collaborations with regulatory bodies and ethics committees for sharingbest practices and ensuring alignment with national regulations.
G. Resources and Support	- Ensure adequate resources, including staffing, funding, and infrastructure, to support the establishment and ongoing functioning of the REB. Allocate resources for training, administrative support, and the implementation of ethical review processes. - Provide researchers with access to ethical consultation services to address any ethical concerns or dilemmas that may arise during the research process. Create channels for researchers to seek guidance and clarification on ethical matters. - Develop comprehensive training programs to educate researchers, review committee members, and other stakeholders on research ethics principles, regulations, and the responsibilities of the REB. Offer regular training sessions, workshops, and resources to promote ethical research conduct.	- Evidence of adequate resources allocated to support the functioning of the REB. - Availability and utilization of ethical consultation services by researchers. - Participation and engagement in training programs by researchers and review committee members.
H. Continuous Improvement	- Implement mechanisms for evaluating the effectiveness and efficiency of the REB. Solicit feedback from researchers, review committee members, and other stakeholders to identify strengths, weaknesses, and areas for improvement. Regularly assess the REB's performance and impact. - Foster a culture of continuous learning and improvement within the REB. Stay updated on emerging ethical issues, advancements in research methodologies, and changes in regulations. Incorporate best practices into the operations of the REB to ensure ongoing enhancement of ethical review processes. - Encourage collaboration and networking opportunities with other research ethics boards, professional associations, and international organizations. Engage in knowledge sharing, attend conferences and workshops, and participate in relevant networks to exchange experiences, learn from others, and enhance the capacity and effectiveness of the REB.	- Evidence of evaluation mechanisms, such as surveys or feedback sessions, to assess the effectiveness of the REB. - Documentation of continuous learning activities, including participation in conferences and workshops. - Demonstrated collaboration and knowledge-sharing initiatives with other research ethics boards and professional associations.
I. International Research Collaboration	- Develop procedures and guidelines for reviewing research proposals involving international collaborations. Consider the ethical implications of research conducted in different jurisdictions and ensure compliance with ethical standards across borders. - Explore opportunities for harmonizing ethical review processes with international standards to facilitate collaborative research efforts while maintaining ethical integrity. Foster collaboration with international partners to align ethical considerations and share best practices. - Promote cultural sensitivity and awareness when reviewing research proposals involving diverse populations and contexts. Recognize and respect cultural differences, ensure informed consent is culturally appropriate, and tailor ethical considerations to the specific cultural and social nuances of the research participants.	- Establishment of specific procedures and guidelines for reviewing international research proposals. - Evidence of collaboration with international partners to align ethical considerations and share best practices. - Demonstrated cultural sensitivity and adaptation of ethical considerations in cross-cultural research settings.
J. Ethical Review Turnaround Time	Measure the time taken by the research ethics board (REB) to review and provide feedback on research proposals. It helps assess the efficiency and responsiveness of the REB's review process.	- Average time taken for initial review and subsequent revisions. - Comparison of review time against established timelines or benchmarks. - Feedback from researchers on the promptness and clarity of review feedback.
K. Compliance Monitoring and Enforcement	Evaluate the mechanisms in place for monitoring and enforcing compliance with ethical guidelines and policies. This column assessment of the institution's commitment ensures adherence to ethical standards and addressing any violations or non-compliance.	- Documentation of compliance monitoring activities, such as audits and inspections. - Evidence of actions taken to address non-compliance, including sanctions or disciplinary measures.

		- Feedback from researchers on the effectiveness of compliance monitoring and enforcement.
L. Research Participant Satisfaction	Assess the satisfaction level of research participants with the ethical review process and their overall experience. It provides insights into the participant's perception of the institution's commitment to protecting their rights and welfare.	- Surveys or feedback mechanisms to gauge participant satisfaction with the ethical review process. - Evaluation of participant feedback, including any concerns or suggestions for improvement. - Comparison of participant satisfaction across different research projects or institutions.
M. Ethical Review Training and Certification	Evaluate the training programs and certification processes in place to ensure researchers and review committee members are knowledgeable about research ethics principles and regulations. This component assesses the institution's efforts in promoting a culture of ethical research conduct.	- Availability and utilization of training programs for researchers and review committee members. - Certification processes to ensure individuals possess the required knowledge of research ethics. - Assessment of the effectiveness of training programs through surveys or evaluations.
N. Research Ethics Board Independence and Autonomy	Assess the level of independence and autonomy of the research ethics board (REB) from undue influence or conflicts of interest. It ensures that the REB can make unbiased decisions and act in the best interest of research participants and ethical standards.	- Documentation of policies or procedures to safeguard the independence and autonomy of the REB. - Transparency in the selection and appointment of REB members. - Review of potential conflicts of interest and measures taken to mitigate them.
O. Research Ethics Communication and Education	Evaluate the institution's efforts in communicating and educating stakeholders about research ethics principles and practices. This column assesses the institution's commitment to raising awareness and fostering a culture of ethical research conduct.	- Communication channels and strategies used to disseminate ethics information to researchers, staff, and students. - Integration of research ethics education into the curriculum or training programs. - Assessment of stakeholders' knowledge and awareness of research ethics through surveys or evaluations.

Table 1 provides a framework for evaluating the effectiveness and compliance of research ethics boards (REBs) in promoting ethical research practices and protecting the rights and welfare of research participants. Each component of the framework is accompanied by a description and indicators of effectiveness and compliance.

A. Preliminary Considerations: This component focuses on the institution's commitment to promoting stakeholder participation and moral research practices. Among the indicators of efficacy and compliance are the existence of a clearly defined institutional policy that promotes moral research practices and the obvious participation of significant stakeholders through feedback mechanisms and consultation logs.

B. Structure and Composition: This section focuses especially on the creation of a formal structure for the REB and the involvement of members with diverse specialisations. The official record of the REB's composition, duties, and structure; proof of a range of knowledge and representation among the membership; and frequent assessments of the membership to uphold competence and diversity are a few indicators of effectiveness and compliance.

C. Development of Ethical Guidelines and Policies: The primary objective of this part is to create policies and processes that adhere to local, state, federal, and international laws, regulations, and ethical standards that are pertinent to research. Written guidelines and policies that are readily available to researchers and stakeholders, evidence of frequent updates and revisions to the guidelines to ensure they are in line with changing ethical standards, and strategies for the guidelines' communication and dissemination are all indicators of their effectiveness and compliance.

D. Implementation of Ethical Review Processes: This component emphasises the establishment of clear policies and procedures for the assessment and approval of research projects, the selection of competent review committees, and the regular and transparent decision-making process. Among the indicators of effectiveness and compliance are the standard operating procedures for proposal evaluation and approval being documented, the evidence of training and development programmes for review

committee members, and the transparency of decision-making processes.

E. Oversight and Monitoring Mechanisms: This part focuses on establishing protocols for reporting ethical concerns, conducting continuous assessments of approved research projects, and conducting audits and inspections to measure adherence. Effectiveness and compliance indicators include documentation of regular reviews of approved research projects, evidence of internal and external audits conducted to assess compliance and identify areas requiring improvement, clear reporting protocols, and evidence of responses to ethical concerns expressed.

F. Collaboration with Relevant Stakeholders: This section emphasises the need of fostering collaboration, communication, and support for institutions, communities, and researchers. Among the efficacy and compliance indicators are documentation of collaborations with regulatory organisations and ethics committees, as well as evidence of community engagement initiatives and the inclusion of community opinions in ethical assessment processes. Additional indicators include the cooperation and support provided to institutions and researchers in order to ensure ethical behaviour and compliance.

G. Resources and Support: This section focuses on ensuring that the infrastructure, funding, and workforce resources are sufficient to support the establishment and ongoing operations of the REB. Among the signs of effectiveness and compliance are the availability of adequate funding allocated to support the REB's operations, the availability and utilisation of ethical consulting services by researchers, and the participation and engagement of researchers and members of the review committee in training programmes.

H. Continuous Improvement: This component prioritises encouraging a culture of lifelong learning, supporting networking and cooperation, and evaluating the effectiveness and efficiency of the REB. Among the effectiveness and compliance indicators are the records of continuing education, proof of assessment protocols to determine the effectiveness of the REB, and endeavours to cooperate and exchange information with other research ethics boards and professional associations.

I. International Research Collaboration: Developing protocols and guidelines for assessing research proposals involving foreign collaborations, looking at ways to bring ethical review processes into line with international standards, and promoting cultural sensitivity are the main goals of this section. Some indicators of efficacy and compliance include the creation of specific protocols and guidelines for assessing international research proposals, evidence of collaboration with foreign partners to harmonise ethical considerations and exchange best practices, and displays of cultural sensitivity in cross-cultural research environments.

J. Ethical Review Turnaround Time: This section assesses the efficiency and responsiveness of the review process by measuring the length of time it takes the REB to review and provide feedback on research proposals. Measures of efficacy and compliance include the average time taken for first and subsequent adjustments, the comparison of review time vs specified deadlines or benchmarks, and the promptness and clarity of review feedback provided by researchers.

K. Compliance Monitoring and Enforcement: This section assesses the systems in place for keeping an eye on and enforcing adherence to ethical standards and rules. Researchers' evaluations of the efficacy of compliance monitoring and enforcement, as well as documentation of compliance monitoring activities and actions done to address non-compliance, are among the indicators of effectiveness and compliance.

L. Research Participant Satisfaction: The overall experience and level of satisfaction of research participants with the ethical review process are assessed in this section. Effective and compliance indicators include the analysis of participant input, the comparison of participant satisfaction across multiple research projects or institutions, and surveys or other feedback mechanisms.

M. Ethical Review Training and Certification: This component evaluates the existing training programmes and certification processes to ensure that researchers and review committee members are knowledgeable about the regulations and guidelines of research ethics. Among the signs of compliance and efficacy are the availability and utilisation of training programmes, the certification processes, and the assessment of the programmes' effectiveness.

N. Research Ethics Board Independence and Autonomy: This component assesses how independent and autonomous the REB is from unjustified influence or intervention. Among the efficacy and compliance indicators are records of the REB's autonomy and independence, evidence of actions taken to prevent conflicts of interest, and evaluations by researchers of the REB's perceived independence and impartiality.

O. Research Ethics Communication and Education: This section assesses their effectiveness in advancing moral research practices and raising public awareness of them. This means examining the channels via which ethics-related information is disseminated, integrating ethics education into curricula or training programmes, and assessing stakeholders' knowledge and comprehension of research ethics. This evaluation helps to guarantee that

those with an interest in doing ethical research are informed and equipped to do so.

4. Ensuring Compliance with Research Ethics Standards

4.1 Creating awareness and education programs for researchers

This part focuses on giving researchers the information and comprehension they need to make ethical decisions when conducting research. Awareness initiatives should be developed to enlighten researchers about the ethical rules and policies established by the research ethics board (REB). These programs might include workshops, training sessions, and instructional materials that stress fundamental ethical concepts, such as informed consent, confidentiality, and protection of vulnerable people (Clark-Kazak, 2021). Education initiatives offer researchers thorough training in research ethics in addition to awareness-raising. Research design, data collecting and management, moral judgement, and acceptable research practices should all be included in these curricula. Giving researchers the appropriate information and abilities will enable them to more effectively negotiate moral dilemmas and guarantee adherence to study ethics guidelines (Sharp et al., 2015).

4.2 Enforcing compliance through ethical review processes

A strong research ethics board is essential for enforcing adherence to research ethics norms. This entails putting ethical review procedures into place for study proposals that scientists submit. Clear protocols for the submission, evaluation, and approval of research proposals should be established by the REB. The degree of risk associated with the research should be taken into account by ethical review procedures when determining the proper level of evaluation that is necessary (Head, 2019). For research with lower risks, this can involve expedited evaluation; for trials with higher risks or involving vulnerable populations, it can involve full board review. The REB assesses the research's ethical components during the review process to make sure it complies with the rules and regulations that have been set forth. This entails evaluating the effectiveness of risk mitigation techniques, privacy protection policies, and informed consent processes. The REB considers conformity with research ethics guidelines while determining whether to approve, request revisions, or reject a research proposal (Bender et al., 2017).

4.3 Investigating and addressing ethical breaches

When there are ethical transgressions, the REB must look into the matter thoroughly and take appropriate measures to resolve the violations. This section focuses on the REB's obligation to look into allegations of ethical transgressions and make sure that appropriate action is taken. The inquiry procedure ought to be impartial, expeditious, and equitable (Page, 2019). It entails obtaining pertinent data, speaking with relevant stakeholders, and taking into account various viewpoints. The investigation's conclusions ought to be recorded and shared with all pertinent parties. The results of the investigation should guide the REB's next steps in addressing the ethical transgressions. This may entail offering suggestions for remedial measures, applying penalties, or, in extreme cases, ending the study altogether. Ensuring accountability and averting future ethical transgressions are the objectives (Page, 2019).

4.4 Periodic evaluation and improvement of the board's effectiveness

Improvement and continuous review are essential to the research ethics board's continued efficacy. This element highlights the necessity of continuously evaluating the effectiveness and procedures of the board. A variety of techniques, including questionnaires, interviews, and feedback systems, can be used for evaluation. To determine the project's advantages, disadvantages, and potential improvement areas, researchers, board members, and other stakeholders will be consulted (Bowser, 2015). Modifications to policies, practices, and training initiatives should be based on the input provided. By routinely evaluating and improving its effectiveness, the board may better ensure conformity to research ethics norms, respond to new challenges, and adapt to changing ethical standards. To verify the board's efficacy and maintain its reputation, it is also possible to conduct regular assessments of itself and by independent parties (Mok et al., 2015).

5. Conclusion

The study's conceptual framework, which calls for the creation of strong research ethics boards, offers a thorough and organised method for resolving moral conundrums in Nigerian academia. The goal of this framework is to ensure that ethical standards are followed while resolving the flaws and challenges in the current state of research ethics. The importance of research ethics in Nigerian academia cannot be overstated. Ethical issues are critical to maintaining

the integrity of research, protecting the rights and welfare of research participants, and building confidence within the academic community. By utilising the conceptual framework this study gives, Nigerian institutions can enhance their research ethics policies and ensure ethical compliance in all research activities. The framework places a strong emphasis on the necessity of defining and assembling diverse, qualified members with the requisite knowledge and comprehension of research ethics for research ethics committees. It also emphasises how crucial it is to give boards precise directives and boundaries, as well as sufficient training to enable board members to fulfil their duties in an efficient manner.

The framework also highlights the creation of ethical standards and norms tailored to Nigerian academics, taking into consideration contextual and cultural elements that can affect research activities in the nation. It also emphasises how important it is to put in place strong procedures for ethical reviews, oversight mechanisms, and coordination with pertinent parties in order to guarantee responsibility and openness in research ethics practices.

The framework also provides suggestions for educating researchers and creating awareness campaigns to help them better understand research ethics and cultivate a culture of ethical research. It also emphasises how important it is to investigate and deal with ethical transgressions, enforce strict adherence to ethical review processes, and routinely evaluate and improve the work of research ethics committees. Through the adoption and implementation of this conceptual framework, academic institutions in Nigeria can fortify their research ethics protocols, safeguard research subjects, and augment the calibre and authenticity of research carried out within their confines. The framework supports the development of ethical research practices in Nigerian academia and acts as a guide for creating and sustaining efficient research ethics committees. The suggested conceptual framework is crucial for Nigerian academics since it offers a methodical way to resolve moral conundrums and set up efficient research ethics committees. By adopting this approach, universities in Nigeria can promote an ethical culture in research, safeguard the rights and well-being of research participants, and responsibly and ethically advance knowledge.

6. Implications

Wide-ranging and important consequences will result from applying the suggested conceptual framework for creating efficient research ethics boards in Nigerian universities. Here are some important conclusions to think about:

The research integrity of Nigerian academic institutions can be improved by creating research ethics boards and putting strong ethical review procedures in place. In order to advance knowledge and guarantee the calibre of academic scholarship, this will strengthen the validity and trustworthiness of research findings.

The rights, welfare, and privacy of research participants will be protected through the creation of research ethics boards and observance of ethical standards. In order to preserve ethical norms and the research-related values of beneficence, justice, and respect, this is crucial.

Strong adherence to research ethics and the creation of functional research ethics boards can improve Nigerian universities' standing both domestically and abroad. Research funding and partnership prospects will rise as a result of this drawing in researchers, collaborators, and funding organisations that value ethical research techniques.

The adoption of the suggested framework will encourage an ethical research culture in Nigerian universities. Researchers will have a greater understanding of ethical issues and the significance of conducting research with integrity through the provision of educational programmes, enforcement of compliance, and investigation of ethical violations. This will support the academic community's general adherence to moral principles and professionalism.

Collaboration with external stakeholders, including business partners, governmental organisations, and local communities, can be facilitated by efficient research ethics boards. Building on mutual trust and confidence in the ethical conduct of research, this collaboration has the potential to produce significant scientific findings as well as mutually profitable collaborations.

By putting the suggested framework into practice, Nigerian academics will comply with international norms for research ethics. In order to obtain financial possibilities, take part in joint research initiatives, and make sure that research conducted in Nigerian universities satisfies the ethical standards of the international academic community, alignment is essential.

7. Recommendations

The present study offers recommendations based on an investigation of research ethics in Nigerian academia as well as a proposed conceptual framework.

Establishing and supporting research ethics committees should be a top priority for Nigerian universities in order to show their strong institutional commitment to research ethics. This entails setting aside funds for board member training, creating rules and regulations pertaining to ethics, and setting up supervision and tracking systems.

Nigerian institutions should invest in training programs for research ethics board members to strengthen their grasp of research ethics and provide them with the essential skills to conduct ethical review processes successfully. Informed consent, data protection, confidentiality, and ethical issues unique to Nigerian cultural contexts should all be included in this training.

To exchange best practices in research ethics, Nigerian universities should encourage networking and collaboration with other universities, research centres, and foreign partners. Joint research projects, exchange initiatives, and attendance at conferences and workshops on research ethics are a few examples of this kind of cooperation.

The development of awareness and education programmes for researchers, students, and faculty members to improve their understanding of research ethics should be given top priority by Nigerian universities. Workshops, seminars, and internet resources that offer advice on moral research procedures—such as how crucial it is to get informed consent, maintain confidentiality, and handle sensitive data—can help achieve this.

Research ethics panels ought to regularly assess their efficacy and pinpoint areas in need of development. As part of this assessment, researchers, study participants, and other stakeholders may be asked for their opinions. The ethical review procedures and guidelines may also be examined to make sure they comply with national and international standards.

Universities in Nigeria should set up transparent reporting procedures so that researchers can report any ethical transgressions they come across. These safeguards ought to preserve the reporter's privacy and anonymity and offer an open method of handling and looking into reported security issues.

Nigerian institutions should engage with regulatory organisations, such as the Nigerian National Health Research Ethics Committee (NHREC), to guarantee consistency with national regulations and norms. This collaboration can assist universities stay updated on the latest trends in research ethics and maintain compliance with national regulations.

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Save in Cloud, Access Anywhere: The Utilization of Cloud Computing in University Libraries for Library Service Delivery in Contemporary Age

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Abstract. Clouds computing as become a cornerstone of modern technology, allowing one to save data on remote servers, accessible from any device with an internet connection. This accessibility fosters inclusivity and expands the reach of library services beyond traditional boundaries. Thus, this study focused on the research "Save it on the cloud and access anywhere: the utilization of cloud computing in university libraries for Library Service Delivery in contemporary age" The multi-stage sampling procedure was used to select the sample for this study. First stage involved stratifying the Universities on the bases of geopolitical zones. Second stage, the Universities in the six states were further grouped according to Federal, State and Private. T18 Universities comprising Federal, State and Private. Final stage involved the use of purposive sampling of total population to draw respondents. An online Google form questionnaire was used for this study and was distributed to respondents through Nigerian Library Association state chapters' online platforms. 157 questionnaire were sent back but 148 respondents accurately filled the form correctly, and as such were considered valid for analysis. Frequency simple percentage and Mean scores were used to analyze the received responses. Result of the analysis show that cloud computing technologies were utilized to a high extent. The challenges affecting utilization of cloud computing technology were Limited staff training on cloud technology usage, and Compatibility issues with existing systems impede integration. The possible strategies for enhancing utilization of cloud computing technology were allocating dedicated budget for cloud technology investments and implementing robust data security measures for cloud solutions. The study suggested, among other things that University library management should increase the training sessions or resources to help librarians know the importance of cloud computing technology and There's need for collaboration between librarians, IT staff, University management and other stakeholder to ensure that infrastructure that will enhance the implementation of cloud computing technology in university libraries for library service delivery.

Keywords: cloud computing, storage, accessibility, service delivery, contemporary age, university

1. Introduction

The aim of university libraries is to provide access to information resources in both print and non-print formats. Balancing access and security in libraries is a difficult but a necessary task. A number of studies have described how crimes and security breaches incidences can affect the provision of library services to users. Holt (2018) identified several such incidents, (i) theft of physical materials; (ii) theft or alteration of data; and (iii) theft of money as major security crime in libraries. Other forms of breaches include non-return of items by borrowers, theft of library equipment, personal theft (from staff and users), verbal and physical abuse against staff and users, and vandalism against library buildings, equipment and stock destruction, all of which can directly or indirectly affects the provision of library services (Opara 2022). Similarly, Lorenzen (2018) reported how different forms of collection mutilation such as underlining and highlighting text in library books, tearing and or removing pages of books and annotating in books margins can temper with the subject-content of library collection, thereby making it unusable to users. Mell (2021) identified the aim of a modern university library as largely to provide access to both

print and non-print collections and this makes it necessary to develop a balance between ownership and access to information or knowledge. This can be achieved by proper planning strategy including the planning for access control in line with the security requirement and the present and future mission or goals of the parent institutions. Ameen and Haider (2018) opined that access to collection is important as this service has supported scholarship in the humanities, sciences and social sciences and remains the key to intellectual freedom.

In contemporary times, libraries are increasingly turning to cloud computing to modernize their operations and services. Cloud computing offers libraries various advantages, including scalability, flexibility, cost-effectiveness, and improved accessibility. One prominent application of cloud computing in libraries is the management of digital collections. By leveraging cloud-based storage solutions, libraries can store vast amounts of digitized materials, such as e-books, journals, and archival documents, without the need for extensive physical infrastructure (Subirana, 2016). Cloud computing is a developing technology model for IT services which many organizations, establishments and even individuals in developed countries are adopting. It transforms the way systems are built and services delivered, providing libraries with an opportunity to extend their impact to clients and the society at large. Kelley in Kutty, (2019) maintains that cloud-based services provide a means for libraries to free resources on web and disseminate information to clients' cloud-based services also bring cutting-edge services to libraries that have less information technology expertise. In this age of information superhighway cloud-based services is important for it offers infrastructure, platform and software as a service.

Above all, because of the enormity of information resources and data embedded in it, cloud computing services is attracting and receiving a great deal of attention and patronage among organizations, establishments, government and individuals. As a web-based technology, cloud computing is a combination of technologies and tendencies (trends) that makes infrastructures and applications more dynamic, more flexible and replaceable. Applications such as e-mails, web conferencing, customer relationships management (CRM) are all tracked in one cloud. Libraries also use computers to run such other services as integrated library management software (ILMS) website or portal, digital library or institutional repositories (Onwubiko, Okorie, & Onu, 2021).

Showing the presence of libraries in the web, cloud computing technology helps university libraries to maintain record data, private and delicate data. They also adopt this technology for electronic journal access, hosting digital libraries, tracking statistical data and integrating library hosting. This implies that a considerable increase of digitized contents urges libraries, archives and learning resource centers to integrate new media of all types like record labels and film archives, neo documents and similar such materials into the general collection and special documents reserved areas (repositories) (Onwubiko, Okorie, & Onu, 2021). Moreover, cloud computing empowers libraries to adopt innovative technologies and services. Libraries can leverage cloud-based platforms for data analytics, artificial intelligence, and machine learning to gain insights into patron preferences, optimize collection development strategies, and personalize user experiences. By harnessing the power of the cloud, libraries can stay at the forefront of technological advancements and meet the evolving needs of their communities (Jiang & Deng, 2018).

As all these are made realizable by cloud computing technology, the utilization of this model in university library services in Nigeria would make the role of librarians and professionals more practical and pragmatic to the service they provide on daily basis. Cloud computing would enable libraries to provide seamless access to resources for patrons across diverse geographical locations. Through cloud-based library management systems, users can search for and access library materials from anywhere with an internet connection. This accessibility fosters inclusivity and expands the reach of library services beyond traditional boundaries (Eneh & Opara, 2020).

More so, public libraries of the modern cloud computing generation envisaged in Nigeria would witness a rapid transformation from conventional libraries to digital and virtual libraries, thus adopting cloud computing model to redesign and restructure the scheme of information services delivery (Onwubiko, Okorie, & Onu, 2021).

Although cloud computing services has the great potentials of revolutionizing university library and information services in Nigeria, it is essential for librarians and library professionals to have a solid understanding of this new technology landscape to move beyond a vague awareness of it to a more nuanced well-informed understanding of such concepts and also to adopt it.

Utilization of cloud computing technology is very important as library service delivery is now more

effective, efficient and timely compared to the traditional mode of operation and service delivery. It makes library operation easier ensures that information needed can be retrieved as quickly as possible and that knowledge are organized easily with less stress. Furthermore, it enhances user satisfaction with the information resources in the library. It saves the time of both library staff and patrons, prevents duplication of work and makes library services smooth and effective. Cloud computing enables library users access their files and applications through the cloud without the need for the application to be available on the user's device, thus reducing the security risks and the required hardware resources, and more. Nevertheless, without utilization of cloud computing technology, the library services will not be rendered effectively. There will be poor organization of knowledge and library operation will be difficult and stressful.

Preliminary observation has shown that university libraries are still striving to get acquainted to the use of cloud computing technologies. Most of them prefer the traditional library services delivery to those enhanced with the use of cloud computing technologies. This is the gap this study is meant to fill. It is on this backdrop that the researchers seek to unravel the mystery behind the research titled "Save it on the cloud and access anywhere: the utilization of cloud computing in university libraries for library services delivery in contemporary age.

Basically, library service delivery deals with the way librarians relate and behave towards the users, colleagues, organizations and the society. As a result of current trends and development in the profession, there are challenges and opportunities which have impact in the delivery of library services. As pointed out by Omekwu in Adam (2018), library service delivery is meant to support organisations, institutions and research by facilitating access to libraries extensive range of information resources and challenges. librarians are expected to brace up for the demand of their work by improving on their competency skills; knowledge and attitude to enable them provide appropriate library service delivery.

For a discourse of this nature and for the present technological pace around the world, the efficiency and relevance of any university library is dependent on the effective delivery of qualitative service to users as well as recognition and careful adaptation of measures in the provision of library and information services capable of meeting societal needs. It is therefore the responsibilities of librarians to deliver on their mandate to the users, colleagues and society by ensuring fairness, justice and equity in the execution of services. The core values must be well articulated and knowledge supported with commitment that would help in upholding individual and collective responsibilities towards knowledge access and provision, doing right and upholding professionalism from the foundation of quality service delivery.

Library service delivery is vital for user's satisfaction. According to Adam (2018), the majority of university libraries offer circulation services, reference services, new arrivals list, Internet and current awareness services and photocopying services. A few of them offer Selective Dissemination of Information (SDI), newspaper clippings, interlibrary loan and fax. Eze and Uzoigwe (2018) and Ayodele and Mohammed (2018) stated that most university libraries in Nigeria provided a variety of services such as reference, Internet, interlibrary loans in support of university education; and provision of various library and information resources such as textbooks, newspapers and magazines, amongst others.
Umoh (2018) also highlighted the services rendered by academic libraries in Nigeria. According to him, circulation/borrowing, referencing, bibliographic verification, current awareness, reprographic, extension/community, technical, and interlibrary cooperation are some of the services provided by academic libraries in Nigeria. Lawal-Solarin (2018) investigated the information needs of students and the role of academic libraries in Covenant University library, Sango Ota, Ogun State. The library services mostly provided to library user in the university included lending service, Internet service, binding/photocopy service, reference services, and abstracting and indexing services, among others. The most used service was the lending service.

The digital age has brought an explosion of data, forever altering how we store and access information. Gone are the days of bulky floppy disks and overflowing filing cabinets. Today, we entrust our vital documents, cherished photos, and creative projects to the vast expanse of the cloud. Cloud computing, a cornerstone of modern technology, allows us to save data on remote servers, accessible from any device with an internet connection. The use of the term "cloud" has been an issue of contention among researchers. Yet understanding the concept of cloud is critical to grasp the issue of cloud computing. Over the past couple of years, various scholars have offered different viewpoints in a bid to define the concept of cloud and cloud computing. However, all the propositions more or less account for a single ideology. Some scholars trace the origin of the term "cloud" to the concealing nature of this technology's

framework where the system works for users yet they really have no idea about the inherent complexities that the system utilizes. What they do not realize is that there is a massive amount of data being pushed globally in real-time to make these applications work for them, the scale of which is simply amazing (Blokdijk & Menken, 2019).

At its core, cloud storage offers a simple yet revolutionary concept: ubiquitous access. By saving files on a remote server, we liberate ourselves from the physical constraints of traditional storage devices. No longer are we tethered to a specific computer or external hard drive. With an internet connection, we can access our data from a laptop at a coffee shop, a tablet on vacation, or even a smartphone while on the go. This mobility empowers us to be productive and connected, regardless of location. Cloud storage not only provides convenience but also fosters enhanced collaboration. Gone are the days of emailing bulky files back and forth. Cloud platforms allow multiple users to access and edit documents simultaneously, streamlining teamwork and ensuring everyone has access to the latest version. This collaborative power is invaluable for businesses of all sizes, enabling real-time document sharing and project management. However, the cloud isn't without its considerations. Security remains a paramount concern. Choosing a reputable cloud storage provider with robust security measures is crucial to ensure the privacy and integrity of our data. Additionally, relying on an internet connection can be a double-edged sword. While it grants access from anywhere, a lack of connectivity can temporarily hinder our ability to access stored files. Cloud computing technologies offer a transformative solution, enabling libraries to enhance access, efficiency, and scalability while reducing costs. Libraries have long been pillars of knowledge dissemination and community engagement, serving as hubs for learning, research, and cultural enrichment. However, in today's digital age, the traditional role of libraries is evolving rapidly, necessitating innovative approaches to service delivery.

In this 21st century era of information age, technology has become the concern of libraries, library managers and information professionals. Technology today plays a critical role in the provision of real time information to clients by libraries. For libraries, managers and professionals (information providers) cloud computing would provide the opportunity of realizing the aforementioned goal. But the question now is what is cloud computing? In the words of Suman and Singh (2018) cloud computing is not a new technology but a new form of computing that has not yet got a definite generally accepted definition and interpretation. However, they maintain that cloud computing is a web-based technology, which is a new form of computing. It is a service provided on the internet or network. It is one of the most important in the 21st century that offers infrastructure, platform and software as a service. Cloud computing is a conjunction of technologies with trends that make infrastructures and applications more dynamic, more flexible and replaceable.

Cloud computing refers to the delivery of computing as a service rather than product, whereby shared resources, software and information are provided to computers and other devices as a metered service (charge for computing services based on usage, similar to how one is billed for water, electricity, phone call services, DSTV, GoTv, Startimes etc. subscriptions at home) over a network, infrastructure, storage of client data and applications that are accessed via a remote computer. However, Greenberg (2018) observed that in spite of the advantages the individual, as well as organizations, derive from the movement toward transitioning computing and storage applications to cloud computing, there are some applications that organizations are choosing not to transit. Cloud computing derived its name from the acronym CLOUD, which stands as C for “Computing resources”, L for “Location independent”, O for “Online accessibility”, U for “Utility for users” and D for “Demand by users” (Yuvaraj, 2018). Computing has been in existence for a while now (Rajan & Shanmugapriyaa, 2022). According to Goldner (2020), the technology actually propelling cloud computing is the advent of internet, the increased reliability and reduced cost of internet, increased use of web-based applications, demand for applications access via multiple devices using multiple form factors. Cloud computing is “a style of computing in which massively scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies” (Pettey & Forsling, 2019).

National Institute of Standards and Technology (NIST, 2021), sees cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The description of Gartner Group and Forrester is cloud computing are apt. They are respectively of the opinion that cloud computing is that style of computing in which massively scalable and elastic, IT-enabled capabilities are delivered as a service to external customers using internet

technologies; and it is a pool of abstracted, highly scalable and managed computer infrastructure capable of hosting end-users (customers) applications and billed by consumption. All in essence imply that cloud computing is a type of computing that basically relies on sharing computing resources rather than having local servers or personal devices to handle applications. Cloud computing is a concept referring to a network computing model that relies on distributed systems to deliver computing services on demand. Rather than requiring local infrastructure and expertise to configure and manage hardware, cloud computing facilities remote access to robust computing power.

Cloud computing is a new technology model or technique for Information and Communication Technology services that is internet based where virtually shared servers provide software, infrastructure, platform devices and other resources and hosting customers on pay-as-you-use basis. All information that a digitized system has to offer is provided as a service in the cloud computing model. Users can access these services available on the Internet Cloud without having any previous know-how on managing the resources involved (Sahu, 2018). Cloud computing is a flexible model. In it, users can also build or prepare their own applications which can also be used by others through the Internet. Cloud computing in all its ramifications provides a common computing platform for users. It provides a shared pool of resources such as storage space, networks, computer processing power and specialized corporate and user applications. In effective and efficient service delivery to clients, cloud computing gives libraries the opportunity to extend their impact because of its transformation of the way systems are built and services delivered.

According to Tritt and Kendrick (2018), cloud computing provides layers of the cloud computing stack of Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Software as a Service (SaaS), but to libraries, SaaS cloud computing technologies are the most accessible and applicable form of cloud computing to library and information services. SaaS refers to software designed for end-users and made available over the Internet. Popular examples of SaaS include Google Docs, Evernote and Dropbox. SaaS computing technologies bring powerful options to those other organizations that do not have the expertise, staff, time or infrastructure to implement and support various computing services.

In view of the foregoing overviews, cloud computing in all its ramifications is anchored on the fulcrum of virtualization, distributed computing, utility computing, networking and web software services. It is a service-oriented architecture, reduced information technology overhead for end-user, great flexibility, reduced total cost of ownership, on-demand services, increase network reliability and efficiency, as increasing the variety of technology resources available from user desktops. Breeding (2022) sums it up by saying "clouds, because of their massive redundancy and clustering are very fault tolerant and since cloud computing is elastic, it can expand or shrink as computer power needs increase or decrease". However, by leveraging the vast resources of the cloud, we can save files anywhere and access them everywhere. This not only enhances convenience and mobility but also fosters collaboration and streamlines workflows. As cloud computing technology continues to evolve, we can expect even more innovative applications and services built upon this powerful and ever-present digital infrastructure.

Cloud computing is a popular and critical phenomenon in the provision of library and information services in advanced countries. Over there, libraries are adequately funded, staffed, equipped, automated and digitalized to promptly adapt to clients changes in demand and technology.

Omwansa, Waema, and Omwenga (2018) reviewed the adoption state of cloud computing across the African continent and reported that South Africa, Kenya, and Nigeria are the leading countries in the use of cloud computing in Sub-Saharan Africa as of the year 2013. They further analyzed the report of a survey carried out by Cisco and World Wide Worx (2018) which found that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria. (Susanto, Almunawar, & Kang, 2022) also reviews that cloud computing has been identified as an affordable option which creates efficiency and effectiveness, reduction of costs involving electricity, bandwidth, operations, and hardware which does not require functional staff, in-house expertise, space, power, and infrastructure to perform.

Ahmed and Othman (2018) highlighted that cost reduction, relief from managing complex IT infrastructure, flexibility, and scalability as some of the advantages of cloud computing adoption. Yeboah-Boateng and Essandoh (2022) in their study of cloud computing usage among small and medium enterprises in developing economies found cost reduction on IT infrastructure and maintenance, improved communication, scalability, and business continuity as the main drivers of cloud adoption.

Biddick (2018) remarked that the most likely applications to migrate to cloud computing are storage and business applications, while specialized information technology applications, such as security, management, or compliance, are far less likely to migrate to cloud computing.

According to Ogunsola (2018), libraries in Nigeria tertiary institutions as the heart of the institution they serve, support research and learning, are therefore not left out in harnessing the opportunities presented by cloud computing service trend, in view of this is evidence to show gradual computerization of Nigerian libraries in the universities through the commencement of digitization and establishment of library information network with connectivity through the university campus network to the Internet. IT News Africa, revealed the successful establishment of digital libraries in three (3) Nigerian Universities by Mobile Telephone Network (MTN) Nigeria. These Universities include the Ahmadu Bello University, Zaria, the University of Lagos, and the University of Nigeria, Nsukka. Breeding (2022) and Goldner (2022) reported that libraries are beginning to adopt cloud computing services and technologies to meet the technological needs of their users thereby saving costs, ensuring flexibility, and enhanced data management. This is due to the benefits derivable from the adoption of cloud services. As Masillamani (2020) rightly noted, cloud computing promotes collaboration, and resource sharing among libraries, librarians, library users through its remote management capabilities.

Generally, cloud computing application is also feasible in the areas of acquisitions, cataloguing, process system, digital content and provision for inclusion of cutting-edge technologies used in libraries and supports various standards such as MARC 21, XML, Z39.50, Unicode and others that are directly related to library and information areas (Suman and Singh, 2018). Also, the critical areas of library services amendable to cloud computing include: Computing E-books Lending Services, Union/Share Cataloguing/OPAC, Digital Preservation/Scanning Service, Article Delivery Service, Current Awareness Service (CAS), Information Common, Collection Development, file sharing, information delivery, e-learning, information literacy and orientation and socialization (Suman and Singh, 2018).

There are a number of challenges that face the use of cloud computing services in libraries in developing nations. According to Ashima and Popli (2018), the cost implication for subscription cloud services and maintenance of access is a major challenge to libraries that are not financially buoyant, and this applies especially to libraries in developing countries like Nigeria where poor funding of libraries has become a perennial issue.

Also, the shortage of skilled manpower to manage and maintain the required ICT Infrastructure and erratic power supply as part of the challenges faced by Virtual Libraries implementation (Aiyebelehin et al, 2018). These have made it practically difficult for Virtual Library in Nigerian Tertiary Institutions to be effectively maintained and its benefits fully harnessed. Coupled with the fact that virtual library is characterized by round the clock availability, these challenges posed a prohibitive cost to the libraries as against the limited available funds.

Other challenges militating against the implementation and use of cloud computing technologies in libraries are:

Security and Privacy Issues: Most cloud solution providers who provide cloud solutions for free or minimal cost, own the data 'clients' put into their cloud and are free to mine the date (Yudah and Geoffrey, 2018). This becomes a serious challenge as sensitive information pertaining to library users may be mined by these cloud solution providers.

Technical Issues: Yudah and Geoffrey (2018) have observed that in spite of cloud solutions being generally well maintained, often to a higher standard than in-house systems, there will be times the system may not work as required. Compounding this challenge will be the lack of skilled technical staff who will address the issues whenever they arise. Apathy by the traditionally trained librarians to acquiring new knowledge and skills in modern technologies that will help them remain relevant (Kimutai and Muli, 2018). Closely linked to this challenge is the inadequate training of young librarians in library schools on digital library operations. For Wasike and Njoroge (2018), inadequate power supply is a major challenge in Africa, to the application of ICTs in libraries. Alternative sources of power are very expensive and the cost of maintenance is very high.

Finance: In Nigeria, a major challenge that faces libraries, irrespective of the type of library is reduced budgetary allocations. Without finance, subscription to the cloud services will not be possible. Poor network and high cost of subscription are other challenges that grossly affect the deployment and usage of cloud computing services in Nigerian libraries. These facilities run on the internet, and most of the internet service providers have very weak network signals at a very high price.

Cloud computing is a developing phenomenon in the ICT, Internet and computing systems technology. It emerged due to developments in this 21st century supersonic information age hinged upon the Internet and associated technologies. Though new cloud computing is popular in libraries across advanced countries and fast spreading to libraries in Asian countries. Thus, what is also good for the goose is good for the gander. This is the motivation for this discourse and presentation of the strategic framework to achieve public libraries operational success in applying cloud computing technology in library and information services delivery.

These strategies include: Government to develop positive attitude to education and information service delivery to the people; an adjunct to the above is that government to come up with a favourable national policy on public library development; public library managers leveraging on the above to evolve and implement a robust and comprehensive ICT policy for service to clients (Onwubiko, Okorie & Onu, 2022). Bearing availability of required fund, library managers should expose present staff members to aggressive training and retraining programmes for them to achieve the new knowledge and skills in cloud computing technology in libraries.

University libraries generally to be adequately staffed because of the enormous demand made on them as a result of emerging changes in the ICT, Internet and computer systems technologies. A corollary to the above is that library managers to embark on strategic staff recruitment exercise that would focus on content, cloud and systems librarians. Cloud computing involves a huge financial outlay; hence libraries in general should be adequately funded. Also, libraries should be adequately provided with ICT facilities. Generally, information professionals to be amenable and adaptable to change and embrace the dynamics of the 21st century super supersonic information age (Onwubiko, Okorie & Onu, 2022

The purpose of this study is to determine the utilization of cloud computing in university libraries in contemporary age.

Specifically, the objectives of the study will be to:

- Identify the cloud computing technologies utilized for university libraries in contemporary age.
- Determine the extent to which utilization of cloud computing technology contributes to university libraries services in contemporary age.
- Ascertain the challenges affecting utilization of cloud computing technology for university libraries services in contemporary age.
- Proffer possible strategies for enhancing utilization of cloud computing technology for university libraries in contemporary age

2. Research Methodology

Descriptive survey was adopted for this study. This was found appropriate because it is more ideal for studying a spread population of librarians across Nigeria. The multi-stage sampling procedure was used to select the sample for this study. The first stage involved stratifying the Universities on the bases of geopolitical zones and using the simple random sampling to select one state from each of the six geopolitical zones. The states are Niger, Zamfara, Borno, Imo, Akwa-Ibom and Osun. In the second stage, the Universities in the six states were further grouped according to Federal, State and Private. At the third stage, the simple random sampling procedure was used to select one Federal, one State and one Private University from the grouping, giving a total of eighteen (18) Universities which are Federal University of Technology, Minna, Ibrahim Badamasi Babangida University, Lapai, Newgate University, Minna, Minna. Federal University, Gusau, Zamfara State University, Huda University, Gusau, University of Maiduguri, Bornu State University, Al-Ansar University, Federal University of Technology, Owerri, Imo State University, Maranathan University, Mgbidi, University of Uyo, Akwa Ibom State University, Ikot Akpaden, Topfaith University, Mkpatak, Federal University of Agriculture, Abeokuta, Tai Solarin University of Education Ijebu Ode and Hallmark University, Ijebi Itele, Ogun state. The final stage involved the use of purposive sampling of total population to draw respondents. An online Google form questionnaire was used for this study and was distributed to respondents through Nigerian Library Association state chapters' online platforms. One hundred and fifty-seven (157) questionnaire were sent back but one hundred and forty-eight (148) respondents accurately filled the form correctly, and as such were considered valid for analysis. Frequency, simple percentage were used to analyse the availability of cloud computing technologies, while Mean score was adopted to analyze the data collected from the respondents. The bench mark for analysis is accepted when the mean is 2.50 and above while a mean of less than 2.50 is rejected. This is because the responses or ratings of 2.50 and above indicates satisfaction or agreement, while those below 2.50 indicate

dissatisfaction or disagreement. It therefore serves as a reference point for identifying significant deviations from the mean within the dataset. The respondents scale and value assigned is SA=4, A=3, D=2 and SD=1

3. Analysis of Data and Results

Research Question 1: What are the cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age?

Table 1: Mean score response of cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age

S/N	ITEMS	Used	Not Used
1	Cloud-based Integrated Library System (ILS) for cataloging and circulation	96(65%)	52(35%)
2	Cloud-hosted Digital Repository for archiving and accessing digital resources.	72(49%)	76(51%)
3	Cloud-based E-book and E-journal platforms for remote access.	67(45%)	81(55%)
4	Cloud-based collaboration tools for virtual team projects	86(58%)	62(42%)
5	Cloud-based Data Analytics for library usage insights	69(47%)	79(53%)
6	Cloud-based Interlibrary Loan systems for resource sharing.	58(49%)	90(61%)

Table 1 shows the mean response of the cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age. From the table it show that Cloud-based Integrated Library System (ILS) for cataloging and circulation (65%), Cloud-based collaboration tools for virtual team projects (58%), we're the cloud computing technologies utilized, while Cloud-based Interlibrary Loan systems for resource sharing (49%) Cloud-based E-book and E-journal platforms for remote access (45%), Cloud-based Data Analytics for library usage insights (47%) and Cloud-hosted Digital Repository for archiving and accessing digital resources (49%) we're not used as cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age.

Research Question 2: What is the extent to which cloud computing technology is utilized in university libraries for Library Service Delivery in contemporary age?

Table 2: Mean score response of the extent to which cloud computing technology is utilized in university libraries for library service delivery in contemporary age

S/N	ITEMS	VHE	HE	LE	VLE	$\bar{x}$	Decision
1	Cloud technology enhances remote access to library resources.	47	53	27	21	2.9	Accepted
2	Cloud solutions improve resource availability and accessibility.	54	59	16	18	3.0	Accepted
3	Cloud-based collaboration tools enhance user engagement and interaction.	51	47	24	26	2.8	Accepted
4	Cloud-based analytics improve decision-making for resource allocation.	49	62	19	18	3.0	Accepted
5	Cloud solutions streamline administrative tasks, improving efficiency.	42	60	23	22	2.8	Accepted
6	Cloud technology leads to overall improvement in user satisfaction.	47	53	27	21	2.9	Accepted

Table 2 shows the mean response of the extent to which cloud computing technology is utilized in university libraries for Library Service Delivery in contemporary age. From the table it show that Cloud solutions improve resource availability and accessibility (3.0), Cloud-based analytics improve decision-making for resource allocation Cloud (3.0), Cloud technology enhances remote access to library resources (2.9), Cloud technology leads to overall improvement in user satisfaction (2.9), Cloud-based collaboration tools enhance user engagement and interaction (2.8) and Cloud solutions streamline administrative tasks, improving efficiency (2.8) we're utilized to a high extent.

Research Question 3: What are the challenges affecting utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age?

Table 3: Mean score response of the challenges affecting utilization of cloud computing technology in university libraries for library service delivery in contemporary age

S/N	ITEMS	SA	A	D	SD	x̄	Decision
1	Insufficient internet bandwidth affecting cloud performance.	40	53	23	22	2.8	Accepted
2	Data security concerns hinder adoption of cloud solutions.	40	62	29	17	2.8	Accepted
3	Limited staff training on cloud technology usage.	45	53	29	17	2.9	Accepted
4	Budget constraints limit investment in cloud solutions.	43	54	24	27	2.8	Accepted
5	Compatibility issues with existing systems impede integration.	48	53	30	17	2.9	Accepted
6	Resistance to change from traditional to cloud-based services.	49	62	20	17	3.0	Accepted

Table 3 shows the mean response of the challenges affecting cloud computing technology in university libraries for Library Service Delivery in contemporary age. From the table it show that Resistance to change from traditional to cloud-based services (3.0), Limited staff training on cloud technology usage (2.9), Compatibility issues with existing systems impede integration (2.9), Insufficient internet bandwidth affecting cloud performance (2.8), Data security concerns hinder adoption of cloud solutions (2.8), and Insufficient internet bandwidth affecting cloud performance (2.8) we're challenges affecting utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age.

Research Question 4: What are possible strategies for enhancing utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age?

Table 4: Mean score response of possible strategies for enhancing utilization of cloud computing technology in university libraries for library service delivery in contemporary age

S/N	ITEMS	SA	A	D	SD	x̄	Decision
1	Providing regular staff training on cloud technology.	51	47	24	26	2.8	Accepted
2	Allocating dedicated budget for cloud technology investments.	49	62	19	18	3.0	Accepted
3	Implementing robust data security measures for cloud solutions.	42	60	23	22	2.8	Accepted
4	Collaborating with cloud service providers for tailored solutions.	47	53	27	21	2.9	Accepted
5	Promoting awareness and benefits of cloud technology among users.	49	62	19	18	3.0	Accepted
6	Creating a roadmap for phased migration to cloud-based services.	64	49	16	19	3.1	Accepted

Table 4 shows the mean response of the possible strategies for enhancing utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age. From the table it show that Creating a roadmap for phased migration to cloud-based services (3.1), Allocating dedicated budget for cloud technology investments (3.0), Promoting awareness and benefits of cloud technology among users (3.0), Collaborating with cloud service providers for tailored solutions (2.9), Providing regular staff training on cloud technology (2.8) and Implementing robust data security measures for cloud solutions (2.8) we're are possible strategies for enhancing utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age.

4. Discussion of Findings

Cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age.

This study revealed that the cloud computing technologies utilized in university libraries for Library Service Delivery in contemporary age were Cloud-based Integrated Library System (ILS) for cataloging and circulation, Cloud-based collaboration tools for virtual team projects, we're the cloud computing technologies utilized, while Cloud-based Interlibrary Loan systems for resource sharing, Cloud-based E-book and E-journal platforms for remote access, Cloud-hosted Digital Repository for archiving and accessing digital resources and Cloud-based Data Analytics for library usage insights we're not used as cloud computing technologies utilized for library service delivery in university libraries for Library Service Delivery in contemporary age.

Omwansa, Waema, and Omwenga (2018) reviewed the adoption state of cloud computing across the African continent and reported that South Africa, Kenya, and Nigeria are the leading countries in the use of cloud computing in Sub-Saharan Africa as of the year 2013. They further analyzed the report of a survey carried out by Cisco and World Wide Worx (2018) which found that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria. (Susanto, Almunawar, & Kang, 2022) also reviews that cloud computing has been identified as an affordable option which creates efficiency and effectiveness, reduction of costs involving electricity, bandwidth, operations,

and hardware which does not require functional staff, in-house expertise, space, power, and infrastructure to perform.

Ahmed and Othman (2018) highlighted that cost reduction, relief from managing complex IT infrastructure, flexibility, and scalability as some of the advantages of cloud computing adoption.

The extent to which utilization of cloud computing technology in university libraries for library service delivery in contemporary age
The findings of the revealed that The extent to which utilization of cloud computing technology university libraries for Library Service Delivery in contemporary age included; that Cloud solutions improve resource availability and accessibility, Cloud-based analytics improve decision-making for resource allocation Cloud, Cloud-based collaboration tools enhance user engagement and interaction, Cloud technology enhances remote access to library resources , Cloud solutions streamline administrative tasks, improving efficiency and Cloud technology leads to overall improvement in user satisfaction we're utilized to a high extent.

Breeding (2022) and Goldner (2022) supported that libraries are beginning to adopt cloud computing services and technologies to meet the technological needs of their users thereby saving costs, ensuring flexibility, and enhanced data management. This is due to the benefits derivable from the adoption of cloud services. As Masillamani (2020) rightly noted, cloud computing promotes collaboration,
and resource sharing among libraries, librarians, library users through its remote management capabilities.

The challenges affecting utilization of cloud computing technology in university libraries for library service delivery in contemporary age

The findings of the study the challenges affecting utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age were Identified as Limited staff training on cloud technology usage, Budget constraints limit investment in cloud solutions, Compatibility issues with existing systems impede integration, Data security concerns hinder adoption of cloud solutions, Resistance to change from traditional to cloud-based services and Insufficient internet bandwidth affecting cloud performance we're challenges affecting utilization of cloud computing technology in university libraries for library service delivery in contemporary age.

This aligned with Ashima and Popli (2018), they discovered that the cost implication for subscription cloud services and maintenance of access is a major challenge to libraries that are not financially buoyant, and this applies especially to libraries in developing countries like Nigeria where poor funding of libraries has become a perennial issue.

Also, the shortage of skilled manpower to manage and maintain the required ICT Infrastructure and erratic power supply as part of the challenges faced by Virtual Libraries implementation (Zam, 2019). These have made it practically difficult for Virtual Library in Nigerian Tertiary Institutions to be effectively maintained and its benefits fully harnessed. Coupled with the fact that virtual library is characterized by round the clock availability, these challenges posed a prohibitive cost to the libraries as against the limited available funds.

Possible strategies for enhancing utilization of cloud computing technology in university libraries for library service delivery in contemporary age

The findings of the study indicates possible strategies for enhancing utilization of cloud computing technology in university libraries for Library Service Delivery in contemporary age are Allocating dedicated budget for cloud technology investments, Collaborating with cloud service providers for tailored solutions, Implementing robust data security measures for cloud solutions, Promoting awareness and benefits of cloud technology among users, Creating a roadmap for phased migration to cloud-based services and Providing regular staff training on cloud technology we're are possible strategies for enhancing utilization of cloud computing technology in university libraries for library service delivery in contemporary age.

Onwubiko, Okorie and Onu, (2022) identified some strategies including; Government to develop positive attitude to education and information service delivery to the people; an adjunct to the above is that government to come up with a favourable national policy on public library development; public library managers leveraging on the above to evolve and implement a robost and comprehensive ICT policy for service to clients. Bearing availability of required fund, library managers should expose present staff members to aggressive training and retraining programmes for them to achieve the new knowledge and skills in cloud computing technology in libraries.

5. Conclusion

The utilization of cloud computing technology in university libraries for library service delivery in contemporary age offers a host of benefits, including increased scalability, accessibility and cost-efficiency. It allows libraries to provide services and resources more flexible, ensures seamless remote access and facilitates collaboration with other institutions. By harnessing the power of the cloud, libraries can modernize their operations, enhance user experiences, and better adapt to the evolving digital landscape, making it a valuable asset in the advancement of university library services.

6. Recommendations

Based on the findings of the study, the following recommendations were made:

- University library management should increase the training sessions or resources to help librarians know the importance of cloud computing technology for library service delivery.
- More emphasis should be placed on strategizing and re-strategizing to ensure a proper integration of library routines into cloud computing technology for library service delivery.
- There's need for collaboration between librarians, IT staff, University management and other stakeholder to ensure that infrastructure that will enhance the implementation of cloud computing technology for library service delivery.

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The Reward System in Secondary Schools and Teachers Productivity in Lagos State, Nigeria

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Abstract. The need for employees in the workplace to be motivated is paramount for employees' commitment, and higher productivity. Teachers as in loco parentis need to be well rewarded for their job to yield maximum output. The study examined the relationship between reward system such as the use of awards, allowances and the productivity level of teachers in Lagos state secondary schools. The study employed the descriptive survey research design. The population consist the 1,737 teachers from the 41 public secondary schools in District 1, Lagos State. A multistage sampling technique was used to select 287 teachers. Three research questions and three hypotheses were raised for the study. The instrument face and content validated were done by colleagues in the field of Educational Management. A pilot study was conducted using 10 schools outside the population. The Crobach's Alfa Co-efficient test of reliability was applied for the data where an alpha level of 0.76 was got. The research questions were turned to hypotheses and tested using Pearson Product Moment Correlation Statistics at 0.05 Level of Significant. The findings of the study indicated that the reward system indices- rent, allowance, merit award and bonuses are related to productivity parameters of prompt completion of coursework, teachers' class attendance and teachers meeting of timeline. Recommendations such as enforcing policy of specific reward system and publicising the various reward for teachers were given to ensure continuous teachers motivation for higher productivity in Lagos state secondary schools.

Keywords: Reward system, productivity, secondary school, teachers, incentives, motivation,

1. Introduction

Employees in organisation such as the teachers in the school, more often than not need and deserve motivational tips to be committed to their job. Teachers are nurturers who impart not only knowledge but morals in their students. The task of teaching is so cumbersome, that the teachers deserve to be inspired to keep the job interesting and be satisfied (Wasiu & Adebayo, 2014). The special means of prompting teachers in their job is the reward system carved out by the school to ameliorate stress, challenges and tension in the job. Reward system is the carefully mapped out plans, activities drawn through the philosophy, policies of the school as incentives for teachers' sterling job performance. The reward system in most schools is usually promulgated by the school managers or school board in form of bonus, promotion, allowance, recognition award, merit award, loans, subsidy, study leave and lunch vouchers. The different reward schemes given to teachers are so vital that they tend to spur their productivity level (Eseyin, 2016). The need for employees to perform their duties optimally in order to be productive is very crucial as reward system help to boost their performance and productivity. Productivity in school is the degree to which the objectives of teaching / learning is achieved through periodic review. Teachers' productivity in Lagos state is usually achievable and measure through their diligence in duties at achieving goals of high student performance, interactive teaching, regular/ punctual class attendance, prompt completion of scheme and meeting deadlines. According to the Lagos State Ministry of Education (2010) teachers should be given tangible reward for productivity to be at an optimal stage.

In Lagos State, attention has been drawn regularly over teachers seemingly non -performance leading to

low productivity due to minimal reward mechanisms (Wasiu & Adebajo, 2014). Teachers in Lagos state secondary schools are often weigh down by large classes. This has resulted in work overload, too many class periods manifesting in stress with no incentive such as reward to boost morale (Abiodun-Oyebanji & Adijat, 2016). Teachers do not have rewards in forms of rent loans to help mitigate the effects of housing which has led to lateness and absenteeism from work. Oftentimes teachers on special assignments win laurels for school with no tangible recognition or bonus. Teachers according to (Bawalla& Nafiu (2018) feel they deserve recognition as part of their reward when they excel in certain task. Teacher recognition is so vital at spurring them to increase productivity as they put in their best to get the merited reward. In another vein, there is the need according to Igbogi (2018) for teachers to be given special tips like lunch vouchers, loans to ease their work life balance as they grapple with conflict of job exigencies. Teachers are not granted study leave which often lead to knowledge stalemate as most of them hardly have time to improve in their area of specialisation. When reward system given to teachers are lacking or below expectations, the students who are the main recipient in achieving productivity bear the brunt. The teachers that are somewhat belaboured with no motivational reward no longer give their best shot at imparting knowledge. In recent time, to keep their family work – life level balance intact, teachers engage in different extra work to make ends meet (Wasiu& Adebajo, 2014). We see teachers in school doubling as merchants as they sell products to colleagues and students. With the supplementary financial aid at balancing work, family and social needs, teachers in Lagos state can hardly seem to boast of high productivity. The major inputs in the school such as money, personnel salary, school building, and qualified teachers no longer produce the desired output of high performance in students' academics as teaching no longer seemed satisfactory for the teachers.

1.1 Statement of the Problem

Lagos state government acknowledged the persistent dwindling productivity of teachers, by bringing in some reward tips, as teachers have been accused of students' poor performance (Wasiu& Adebajo, 2014). The seeming cushioning mechanism was just a drop in the ocean according to NUT (2015). The secondary schools were only given periodic reward which do not cover up to 20% of the teachers in the state. This nonchalant act of the government in not according the teachers their due reward, plummeted the school teachers' morale. Teachers when not given their due recognition tend to be dissatisfied in their job as class attendance, punctuality and meeting deadlines suffer. Being productive according to Vargese, Kalyanasundaran & Chandra (2015) builds a sense of accomplishment for the school and the teacher. Reward system is a motivational technique that should be used by school managers to induce teachers at putting in their best. The Maslow physiological needs of basic food, shelter and clothing must be rejuvenated through reward in the school for teachers to be productive. This is not the case in Lagos state, teachers are hardly rewarded, and when it is done it is often selected for merited few, which is insignificant (Wasiu& Adebayo, 2014). Most school managers persistently hampered on productivity but reward is not given to spur the teachers. Lagos state has continually coerced teachers to produce students with excellent results. This according to Tangen (2005) is impossible, the authored viewed productivity as a two-way system. Productivity should be induced by the government through appropriate reward system. When reward schemes are not in place as experienced in the state, the school managers no longer have the morale justification to penalise teachers on any default. Teachers will always want to be rewarded and given suitable deserve incentive, it is against this background that the study seeks to examine the reward system in Lagos state schools and how they impact on teachers' productivity.

1.2 Objectives of the Study

The study sought to examine the relationship between reward system (allowances, bonuses, merit/ recognition awards) and teachers' productivity level (punctuality, scheme completion, meeting timeline, interactive teaching) in secondary schools. Specifically, the study sough to:

- Determine how rent allowance relate to teachers Prompt coursework completion
- Examine the relationship between merit awards and teachers class attendance
- Ascertain how bonuses relate to teachers meeting of timeline

1.3 Research Questions

The following research questions were raised for the study:

- To what extent does rent allowance relate to teachers' prompt completion of coursework?
- How do merit awards relate to teachers' class attendance?
- To what extent do bonuses relate to teachers meeting of timeline?

1.4 Hypotheses

The following hypotheses were drawn from the research questions:

- Rent allowance does not significantly relate to teachers' prompt completion of coursework.
- Merit awards do not significantly relate to teachers' class attendance.
- Bonuses do not significantly relate to teachers' meeting of timeline.

2. Literature Review

2.1 Concept of Reward System

Reward system is the collective action embarked upon by the organisation to compensate employees for their hard work. In the school, it involves the physical and non-physical incentives provided to teachers in order to incite them towards greater work accomplishment. Reward system according to Adelabu (2005) is a factor of motivation developed by the school management springing from its goals and objectives. Robert (2005) defines reward system as the process of developing and implementing strategies, policies and systems which help the organisation to achieve its objectives by keeping the personnel motivated thereby increasing Commitment. The major aims of reward system according to Ozoemena (2013) include and not limited to attracting, retaining and motivating employees towards the attainment of organisation's goals. There are two types of reward- the intrinsic and the extrinsic rewards. The intrinsic reward are non-financial incentive aimed at beefing up the psychological needs of the employees while the extrinsic are financial prizes provided to satisfy employees in form of cash, allowances and bonuses (Neckermann, & Kosfeld, 2008).

2.2 The Concept of Productivity

The need for personnel to perform optimally in an 109rganization such as the school leads us to productivity. Productivity in the school is achievable according to Eseyin (2016) through periodic review of the entire teaching processes which involve teachers and student performance. Productivity is a relative and nebulous term. Productivity is measured mostly in terms of performance, it is not measured in terms of money alone, there are other variables used in measuring productivity in the organizational structure (UNESCO 2003). In the educational sector, productivity deals with the relationship between the total educational output and the input resources. It is measured in quantity and quality terms. Thus, according to UNESCO (2003) productivity is measured using students' factors such as learning attitude, discipline, examination scores, vis a vis teachers' attitude to teaching. Productivity of teachers is often influenced through work relations, work life balance and reward indices. It can be measured according to (Vargese, Kalyanasundaran & Chandra (2015) through self-assessment, comparison with coworkers and assessment procedures.

For any organization such as the school to function effectively, teachers' job performance is very vital. Armstrong (2010) opined that one of the most important, responsibilities undertaken by managers is to ensure that employees achieve high level productivity in their duties. Consequently, school managers consider productivity so vital as teachers' poor performance such as lateness, absenteeism, non-completion of course work, adversely influence teaching quality, learning outcomes, and social development (Bennell &Akyeampong, 2007). Job performance organization in high productivity often involved motivation through reward system in any organization. For teachers to be productive, the working conditions of the school is very pertinent, when they perceived their working conditions as negative, commitment become low. In order for employees such as teachers to be productive, reward system in terms of incentives have to be put in place (Ogundele, 2006). Teachers' productivity bothers on commitment, quality and psychology. According to Vargese, Kalyanasundaran & Chandra (2015), it is often related with the psychological wellbeing of the teacher. The author further opined that, a motivated teacher with sound mind, produces high achieved student as it becomes a reciprocal venture.

2.3 Conceptual Framework

The study is hinged on Frederick Herzberg's Two-Factor Theory, also known as Motivation-Hygiene Theory or intrinsic vs. extrinsic motivation. The theory stated that there are certain factors in the workplace that can cause job satisfaction and a separate set of factors that can cause job dissatisfaction. According to the theorist, these factors are not in a linear relationship.

The first set known as the intrinsic motivators, are intrinsic to the job, they motivate people at work; they deal with the job content, their presence cause satisfaction. They include: achievement, recognition, the work itself, responsibility, advancement, and personal growth. These factors are the conditions that truly encourage employees to work harder such as the various reward system mechanisms in the school.

The next sets of factors are the hygiene/extrinsic factors, they are associated with the job context i.e. the work environment. They include: company policy, supervision, interpersonal relation with superiors, interpersonal relation with peers, interpersonal relation with subordinates, salary, personal life, status and job security. Herzberg posited that if the hygiene maintenance factors are present in the organisation, the worker will be motivated but the workers become dissatisfied when they are absent. Thus the intrinsic (satisfaction factors) motivators according to (Bello & Jakada, 2017) tend to inspire motivation when they are present, while extrinsic motivators (dissatisfaction /hygiene factors) reduce motivation when they are absent. The absence of satisfaction does not amount to dissatisfaction just as the absence of dissatisfaction does not amount to no satisfaction but result in no motivation. Thus, the absence of both brings the state to zero in the organisation.

The theory is vital to the study as the school managers being conversant with the two factors will try as much as possible to incorporate them in the reward system. Herzberg's Theory can be applied by school managers to motivate employees. Managers should identify the hygiene factors in the teachers and try to provide them thereby eliminating dissatisfaction among workers. This will result in conducive work environment and boost productivity (Johnson, Houmanfar & Smith, 2010). Also, school managers should be aware of motivators in work place such as improved job content through self- esteem and self-actualisation reward mechanism like promotion and training. This will motivate workers to put in their best in a convivial mood thereby enhancing performance and boosting productivity.

The school manager should as a matter of urgency integrate the two factors' indices in the school policies, goals and objectives which will be realised in the reward system. This will include policy of reward such as promotion, merit award, bonuses, union involvement, loans, housing scheme, lunch vouchers, leave allowance, health care services and long service award. If these indices are part of the school policy found in the reward system, the teachers will be motivated to work harder leading to high productivity. The productivity of teachers will be expressed in prompt completion of scheme, commitment to duties, regular class attendance, interactive teaching, highly motivated students and excellent students' results. The application is depicted in the model in Figure 1.

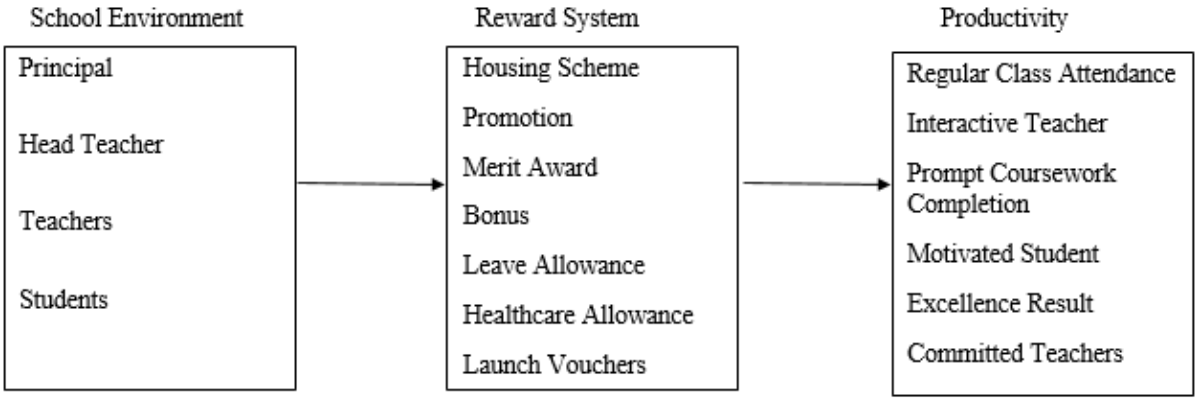

Fig 1: Productivity Hygiene Two - Factors Model

3. Research Methodology

The study employed the descriptive survey design. The population of the study comprised the 1,737 teachers from the 41 public secondary schools in District 1, Lagos State. District 1 comprised three Local Government Area- Alimosho, Agege and Ifako-Ijaye. A multistage sampling technique was used to select participants for the study. Proportionate sampling technique was used to select eight schools from Alimosho and three schools each from Agege and Ifako-Ijaye respectively. Thereafter simple random sampling was used to select 166, 57 and 64 teachers respectively from the three Local Government Areas bringing the total sample to be 287 teachers. A researcher constructed questionnaire titled Reward System and Teacher' Productivity Questionnaire (RSTPQ) was drafted for the participants. The instrument construct was on a Likert type rating scale encompassing 35 items bothering on reward system and productivity indices. The instrument face and content validated was done by colleagues in the field of Educational Management. A pilot study using 10 schools outside the sample was used to ensure reliability of the instrument. The Crobach's Alfa Co-efficient test of reliability was applied for the data where an alpha level of 0.76 was got. The results of the study were analysed using Pearson Product Moment Correlation Statistics to test the hypotheses. All the hypotheses were tested at 0.05 Level of Significant with the Statistical Package for Social Sciences (SPSS).

Table 1

Demographic Statistics of Participants

Variables		Frequency	Percentage
	Male	142	49.5
Gender	Female	145	30.5
Total		287	100
Age	25-30	34	11.8
	31-36	65	22.6
	37-42	71	24.7
	43-48	62	21.6
	49-54	30	10.5
	55 and above	25	8.7
Total		287	100
Educational Qualification	B.Sc./ B.Ed.	142	49.5
	M.Sc./M.Ed.	134	46.7
	Ph.D.	11	3.8
Total		287	100

Table 1 represents the demography data of the participants. The distribution by gender showed that 142 49.5% were males while 145(50.5%) were females. The age distribution indicated that the middle age participants were more with 71 (24.7%), followed by the 31-36 age bracket of 65(22%). The older participants of 55 years and above are the least with 25(8.7%). The educational qualification showed that participants with B.Sc. / B.Ed. were 142 (49.5%), those with M.Sc. / M.Ed. were 134(4 6.7%) while the highest degree Ph.D. holders being he least were 11 (3.8%).

4. Analysis of Data

Hypothesis 1: Rent allowance does not significantly relate to teachers' prompt completion of Coursework.

Table 2:

Rent Allowance and Teachers' Prompt Completion of Coursework

Variable	N	Mean	SD	r	P	Remark
Rent Allowance	287	47.53	7.29	0.56	0.01	Ho rejected
Teachers 'Scheme Prompt Completion		48.21	9.16			

Result significant @ 0.05 significance level

Table 2 presents the relationship between rent allowance and teachers prompt completion of coursework. The result shows that there is a positive significant relationship between rent allowance and teachers' prompt completion of coursework ($r=0.56$, $p=0.01<0.05$). The null hypothesis is rejected and the alternative accepted. Thus, rent allowance given to teachers is related to their prompt coursework completion as an index of productivity.

Hypothesis 2: Merit awards do not significantly relate to teachers' class attendance.

Table 3

Merit Awards and Teachers' Class Attendance

Variable	N	Mean	SD	r	P	remark	Remark
Merit Awards	287	30.05	7.29	0.51	0.01	Ho rejected	Reject Ho
Teachers' Class Attendance		48.01	9.16				

Result significant @ 0.05 significance level

Table 3 presents the relationship between merit award and teachers' class attendance. The result shows that there is a positive significant relationship between merit award and teachers' class attendance ($r=0.51$, $p=0.01<0.05$). The null hypothesis is rejected and the alternative accepted. Thus, merit award given to teachers as a form of reward is related to teachers' class attendance as an index of productivity.

Hypothesis 3: Bonuses do not significantly relate to teachers meeting of timeline.

Table 4

Bonuses and Teachers' Deadline Meeting

Variable	N	Mean	SD	r	P	remark	Remark
Bonuses		20.67	4.54				
	287			0.42	0.01		
Ho rejected							Reject Ho
Teachers' Deadline meeting		48.01	9.16				

Result significant @ 0.05 significance level

Table 4 presents the relationship between bonuses and teachers meeting of deadline. The result shows that there is a positive significant relationship between bonuses and teachers meeting of deadline. ($r=0.42$, $p=0.01<0.05$). The null hypothesis is rejected and the alternative accepted. Thus, bonuses given to teachers for their reward is related to teachers meeting of timeline as an index of productivity.

5. Discussion of Findings

The study found that rent allowance as a reward system is positively related to teachers' prompt completion of their course work being one of the parameters for measuring productivity in Lagos secondary schools. This finding is worthy of note as the whole essence of teachers' productivity through their job performance revolved round the teaching activity itself. Teachers according to Akiri & Ugborugbo (2009) must be steadfast in attempting all the topics in their scheme of work. The authors noted that the quality of students' performance is reflected in teachers' swift realisation of their goals. This prompt completion of coursework by teachers can only be attributed to incentives of reward system such as rent allowance. Lagos state, the scope of the study is metropolitan in nature, housing is not only scarce but expensive (Enisan, 2017). Rent allowance given to teachers must be such a veritable force in inciting teachers towards prompt completion of their scheme. The researcher is of the opinion that the rent allowance cushioned the effects of hardship faced by most teachers in scrambling to secure accommodation, hence its motivating influence to increase performance and productivity. Salman, Mohammed, Ogunlade, & Ayinla (2012) corroborated this finding in their study. The authors found that most teachers and students agreed to the fact that payment of allowances in terms of salary advance and rent contribute to teachers' performance realised in high productivity.

The fact that personnel always loved to be recognised and acknowledged for higher performance was buttressed in hypothesis 2. The study found that merit award as a reward system given to teachers is positively related to their class attendance as a parameter for productivity in Lagos state. This finding is apt as it relates with Herzberg hygiene theory where intrinsic factors such as merit award, recognition propel employees to satisfaction and high productivity (Igbogi, 2018). The average employee such as the teachers have the need to be sought for, wanted and recognised as they perform their duty. Lagos State have as its reward system annul merit award given to deserving teachers which according to Thisdaylive (2020) is not sufficient to motivate them towards interactive regular class attendance. Class attendance wherein teachers actually teach and master their subject matter is the hallmark of a productive teacher (Oni, Nwajiuba & Nwosu, 2017). The authors in their study opined that reward system that brings out the sterling quality of the teacher such as merit award incite them towards improved class attendance which in turn reflect in high productivity through excellent students' results. When employees as in Lagos state secondary schools' teachers have negative perceptions of their working conditions anti productivity factors ensue in the school. This will be exhibited by the teachers through non-commitment, lateness to school, low morale and irregular class attendance.

The result of the study on hypothesis 3 stated that monetary bonuses such as extra and additional money in specific times relate to teachers meeting of timelines

in Lagos state. Bonuses as reward system to teachers like Christmas bonus, bonus on salary and on special conduct, inspire them toward meeting any timeline as deadline for duties. This result is in line with Neckermann & Kosfeld (2008) study that extrinsic reward such as monetary compensation, bonuses and insurance satisfy employees' physiological and self actualisation needs. When the teachers are satisfied through bonuses as the reward system, their performance in meeting up duties would be improved. Bonuses which are extra payment to teachers do not only satisfy teachers physically but psychologically towards stimulated high productivity (Ozoemena, 2013). The author noted that prizes and bonuses given to teachers act as stimulus towards developing knack for task completion as meeting deadlines. Monetary reward system more often than not serve as a time booster towards meeting set timeline. Teachers being morally and intellectually equipped would not default in timelines knowing it would reflect on their monetary reward and in turn build up their security, social and emotional needs.

6. Conclusion

Productivity is nebulous, it refers to the different factors in the organisation such as the personnel and the various duties performed according to the policies of the organisation. In the educational system, productivity denotes the ratio between the total educational outputs (the various teaching staff, their assigned duties) and the output (the results of the student, their moral and discipline tone). In Lagos state secondary schools, parameters for productivity include teachers' performance of duties, their attitude to work and student attitude to leaning vis a vis their academic performance. The reward system includes the different policies strategies employed by the school to compensate their teachers in different form. It is normally in form of salary increment, merit awards, bonuses, rent and housing allowances, loan and promotion. The study through its findings on the relationship between reward system (rent allowance, merit awards, bonuses) and productivity of teachers in terms of prompt completion of coursework, class attendance and meeting deadline, found a positive correlation between the variables. Reward system such as the allowance, merit award and bonuses acted as catalyst booster towards inducing teacher in Lagos state for higher productivity. This productivity is realised in teachers prompt completion of coursework, regular class attendance and meeting of deadlines of duties. Thus, productivity in Lagos state secondary schools which is attainable through intermittent review of the entire teaching process is greatly influenced through various reward system given to teachers as laudable as this reward system is, in boosting productivity in the state, it is noteworthy that their usage is minimal or reduced to an annual ritual.

7. Recommendations

The following were given based on the findings for a favourable reward system policy in Lagos state secondary schools:

- The state government should as a matter of necessity liaise with the education state board directors to formulate policies detailing the various reward that should be given to teachers for improved productivity.
- Merit award in Lagos state secondary schools should be given to deserving staff all through the school calendar year to inspire the whole teaching staff towards striving to get the award.
- Housing being so vital to teachers for improved school and class attendance should be given to them through organised housing estate for teachers in the state.
- Teachers with outstanding performance through the productivity parameters in the schools should be publicly recognised with bonuses in monetary form serving as inspiration to others.
- Reward is a catalyst for improved productivity, it should not be restricted to an annual ritual, and it should be given to teachers on a regular basis to enable continuous improvement.

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Awareness and Utilization of Big Data Management System by Lecturers in Universities: A Survey of Universities in Nigeria

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Abstract. The research investigated awareness and utilization of big data management systems by lecturers in universities: a survey of universities in Nigeria. Lecturers at four (5) public universities in Nigeria namely: University of Port Harcourt, Imo State University, University of Benin, Benin City, Kogi State University and University of Lagos made up the population. The information was gathered via an online questionnaire that was distributed to respondents. Out of the 162 online responses, only 148 were valid and used for the analysis. Frequency, simple percentages and Mean scores were used to analyze the data. Results of the analysis show that lecturers are not aware of big data management tools and they do not know how to use big data management system tools. The increase in the number of data and the wide spread of technology were the two factors that contributed to the adoption of big data management systems. The study suggested, among other things, that information technology leaders of universities ideally demonstrate the importance and use of Big Data management system in their information technology strategic plans in order to address the need for big data management skills among lecturers in universities in Nigeria.

Keywords: Big Data, Big Data Management System, University Lecturers, Information and Communication Technology Skills

1. Introduction

The idea of Big Data is becoming more popular due to the proliferation of data from different sectors of human endeavor. It is noteworthy however, to note that some scholars have identified Big Data Management is a field that requires adequate planning and investment in both training and technology (Harwell, Vivian, McLaughlin, & Hafner, 2019, Heripracoyo et al., 2019, Corti et al., 2019, Ma et al., 2019) Big data has developed into a helpful tool for a variety of purposes, including social integration, excellent education, and corporate competitiveness. The proliferation of information in modern civilization has given rise to big data. The rise in public involvement in data production and sharing can be used to characterize big data. Enterprises generate vast amounts of transactional data as well; they compile billions of bytes of information on their clients, partners, and internal processes. In the era of the internet of things, millions of networked sensors that perceive, generate, and share data are being incorporated into commonplace items like smartphones, smart energy meters, vehicles, and industrial gear. In actuality, businesses and organizations produce enormous amounts of digital data as a result of how they run and engage with their customers (Oguntimilehin & Ademola, 2014). Social media platforms, cellphones, and other consumer gadgets like laptops and PCs, billions of individuals worldwide can now add to the quantity of Big Data that is available. Big Data's exponential development has also been significantly influenced by the amount of multimedia material (Lindgren, 2020). In their research work, Harwell, Vivian, McLaughlin & Hafner (2019), stated that Big Data have ushered in the promise of new research possibilities. They noted that in indicator research and development, big data has most assuredly found a home.

The Big Data management system includes tools and methods for gathering, storing, sharing, arranging, and assessing massive amounts of data in different formats (Cope and Kalantzis, 2016). The six values—volume, velocity, truthfulness, diversity, verification, and value—were used to define big data. "Volume" are large amounts of data that are difficult to handle, analyze, store, and present, whereas "velocity" refers to the speed at which information passes through an organization. Veracity means trust, biases, and uncertainty in the data, whereas variety refers to whether the data is structured or unstructured. Verification is concerned with data security, whereas value is related to the usefulness of data generated for guiding decision making. Big data is transforming into extremely structured and unstructured types of complex data. Big data is defined as information that cannot be collected, managed, stored, or analyzed using any conventional data methods due to its size, complexity, or dynamic nature. It discusses data that is too large and moves too quickly for traditional data analysis techniques to manage. It is a common data that contains all types of data (White, 2015). A single massive data collection can truly range in size from a few Terabytes to many Zettabytes, depending on the specific context in which the data is employed (Jinchuan, et.al, 2013).

The volume of data is increasing in public and private organizations with no exception to universities of higher learning. University data ranges from the personal data of staff and students to records of university dealings with other bodies. Academic data are the major information that forms the collection of university's data sets (Eneh & Opara, 2021). These data is multiplying in increasing value causing the influx of unsystematic sets of information leading to the concept of big data in universities. As a result of this, big data management system becomes a necessity to ensure proper control, evaluation and interpretation of Big Data. Big data management system is a growing technology that is used to handle big data. It is a software that helps to collect, process, organize, store and distribute large data characterized by the 6Vs. It is an educational tool that also functions as administrative software for donor tracking, student performance monitoring, recruiting and admissions, and financial planning (Eguavoen & Okodugha, 2022) Lopez-Belmonte et al (2019) asserted that the progress of technology in the field of education has led to the development of new professional skills in the teaching community, such as digital competence. Likewise, it has propagated the appearance of new learning environments mediated by technological resources that favor the generation of a large volume of data, known as Big Data, derived from the interactions of educational agents in virtual environments (Lopez-Belmonte et al, 2019).

While Sabharwal and Miah (2021) observed that a steadily expanding number of organizations has been endeavored to utilize Big Data and organizational analytics to analyze available data and assist with decision-making, several other scholars have gone ahead to expose some of the success stories of bid data analytics as used in business. Such success stories are seen in areas such as, Manufacturing industry (Zhang, Huang and Bompard, 2018), Hospitality (Richard 2017), Food industry (Anaf, Baum, Fisher, Harris & Friel 2017), Entertainment industry (Fouladirad, Neal, Ituarte, Alexander and Ghareeb 2018), Finance (Bernard M. & Co. 2018), Online business (HBS.2020), SMSE (Seseni, & Mbohwam 2019). and many others.

In the educational sector, Big Data management system are broadly divided into two such as, Learning analysis (LA) and academic analysis (AA) software (Daniel, 2014). Software designed specifically for learning analysis collects information on learners and their environments in order to enhance student learning. The goal of academic analysis software is to increase institution efficiency by using student, academic, and organizational data. Big Data management system becomes an imperative management tool in effective management of Big Data in universities. Big Data management support lecturer collection and interpretation of data and lecturer to students' assessment of learning activities. The continuous monitoring of lecturers' development, appraisal and contribution to knowledge is checkmated through Big Data management system. In today universities appraisal, the area of researches and impact to the body of knowledge is evaluated by Big Data management system. For example, monitoring and evaluation of the numbers of lecturers' work cited by researchers is a fast-growing appraisal method in universities and this could be said to be managed by Big Data management system.

Big Data management system offers opportunities for different educational institutions' information technology resources to be used effectively in order to advance lecturer development and promotion to an advanced rate of achievement as well as to improve student outcomes for the achievement of the university's goal. As a result, research of professors' knowledge and usage of big data management systems in Nigerian universities is necessary.

1.1 Statement of Problem

The increasing prevalence of bog data in today's technological landscape has prompted universities to explore its potentials applications. Big Data involves variety of data, of a high volume and very complex data and requires that it be adequately managed to enable it become meaningful to users; hence, the need of Big Data management system. However, a critical issue arises in the form of limited awareness and utilization of big data management systems within academic institutions. Despite the transformative capabilities of these systems in fostering data-driven decision-making, research advancements, and administrative efficiency, many universities face a considerable gap in understanding their functionalities and implementation strategies.

Research on the use of Big Data management systems by lecturers in Nigerian universities has not been done, despite indications from studies that the universities are implementing these systems to handle massive amounts of data. This constitutes the focus of this research work.

1.2 Objective of the Study

The objective of this study is to investigate the awareness and utilization of Big Data management systems by lecturers in Universities in Nigeria. Specifically, the study tends to:

- Determine the level of lecturers' awareness of Big Data Management Systems in Universities in Nigeria
- Investigate the advantages of Big Data Management Systems by lecturers in Universities in Nigeria.
- Ascertain the utilization of Big Data Management Systems by Lecturers in Universities in Nigeria.
- Investigate the factors influencing the utilization of Big Data Management Systems by Lecturers in Universities in Nigeria.

1.3 Research Questions

- What is the level of awareness of Big Data management systems by lecturers in Universities in Nigeria?
- What are the advantages of Big Data management systems by lecturers in Universities in Nigeria?
- What is the use of Big Data management systems by lecturers in Universities in Nigeria?
- What are the factors influencing the utilization of Big Data management systems by lecturers in Universities in Nigeria?

2. Review of Literature

One of the most important indicators for a country's development and progress is its university system. The pursuit of knowledge and the commitment to ensuring that it has been improved as well as the provision of a balanced education for the development of people's lives and society at large are two of universities' main goals. In structured institutional learning and training center, a modern university includes faculties for traditional fields of study such the humanities, arts, management, and sciences, as well as more specialized universities for the study of engineering, science, technology, and agriculture (Alemu, 2018). Through guaranteeing the supply of labor, fostering a nation's socioeconomic development, and fostering the intellectual growth of individuals, communities, and society at large, university education plays an enabling function in society. Therefore, the university system differs from all other institutions due to its key task. A university's worth as an institution is always changing and starting to take on new dimensions. The introduction of numerous technologies in modern life is enhancing higher education institutions' ability to meet the new problems. It is crucial that the vast amounts of data that the educational system generates be properly evaluated and analyzed in order to correctly respond to current issues. We will be able to project the effects of how important learning is thanks to this. In their research work titled, Impact Assessment of Big Data on Higher Education Management Based on Time-Varying Clustering Sampling Algorithm, Liu and Song (2021), stated that in university management, big data still presents many and complex characteristics, such as student registration for freshmen, book borrowing, or score entry for teachers. They noted that the generation of these data needs to be managed reasonably and effectively. Research scholars Tiwari, Wee & Daryanto (2018), have identified three big data analytics analytical classis to include, predictive, the descriptive and the prescriptive. They described the predictive as that which deals with questions such as what will or is likely to happen, by exploring data patterns with relatively complex statistics, simulation, and machine-learning algorithms. While the descriptive deals with straightforward questions regarding what is or has happened and why—with 'opportunities and problems' using descriptive statistics such as historical insights, the prescriptive deals with questions regarding what should be happening and how to influence it, using complex

descriptive and predictive analytics with mathematical optimization, simulation, and machine-learning algorithms

Big Data has the ability to completely transform academic research and instruction. Ademola (2014) defines big data as information sets that are too big and complicated for conventional data processing techniques to handle. The term "big data" describes sets of data that are too massive to be efficiently acquired, managed, and analyzed using conventional technical methods. A quantitative comparative examination of the different strategies used by 35 Charter schools was carried out in 2012 by Divyakant et al. They discovered that using big data to inform education was one of the top five strategies associated with quantifiable academic performance. Using this data, the most effective teaching methodologies might be created, starting with fundamental subjects like reading, writing, and math and working up to more difficult college-level courses. A relational viewpoint claims that big data management systems appeal to higher education institutions because they allow them to strategically use their IT resources to increase performance, increase student resilience, and increase completion rates (Anikweze, 2019).

When correctly assessed, university institution data may play a significant role in determining how some difficult problems could be solved (Marsh, Maurovich-Horvat & Stevenson, 2014). Murumba and Micheni (2017) contend that in order to provide the finest learning environments for the benefit of society, institutions must employ big data analytics. In addition to tracking use and performance statistics that support the monitoring required for developing or implementing technology, IT analytics may also be used to create data standards, tools, procedures, organizational synergies, and policies, according to Daniel (2015). Data from a range of systems, including alumni networks, learning management systems, student information systems, and systems that control learning outside of the classroom, are believed to be able to be integrated via IT analytics.

University presidents, corporate leaders, and government decision-makers must now establish new standards and expectations for data in this new era of Big Data maturity (Burns, 2016). Accountants and auditors ought to start creating some basic compliance guidelines for data management, collection, security, interoperability, privacy, and other areas despite the massive costs (Samiddha & Ravi, 2016). To handle Big Data, however, new methods of data administration must be developed. According to Kellen, Reektenwald, and Burr (2013), a class of people with particular expertise and experience are required to gather data from multiple sources, combine them, evaluate them, and identify previously concealed patterns. They admit that a recurring challenge for corporations has been the volume of data and the challenge of putting it into shape. In order to work with diversified teams of colleagues who comprehend programming languages as well as the cognitive, behavioral, social, and emotional views on learning, Nigerian higher education teachers must acquire new abilities and knowledge. Learning new professional abilities is essential (Gibson, 2012).

On the other hand, it is essential to look into innovative strategies for enhancing and monitoring students' academic progress as well as other institutional regulations (Tulasi, 2013). The way that students learn and teachers teach will revolutionize and develop cutting-edge educational strategies thanks to the use of big data management systems (Alonso & Arranz, 2016). Financial, enrollment, academic, extracurricular, and instructional information on students is crucial to doing a full study of them and learning how to choose future courses in an educated manner (Kelechi et al, 2020). It affects every part of the university system, including management, instruction, and learning. The availability of copious amounts of data in university management departments has made proper data management, use, and analysis crucial (Ahiauzu & Agundu, 2014). The ability to examine such a large amount of data and evidence for decision making has been made possible by big data management software. Businesses, governments, and academic institutions have long produced enormous data sets (Rob, 2014). Big data management systems offer higher education institutions a strong basis for leveraging the vast array of data available to them to define the future of university education (Alonso & Arranz, 2016).

In the context of e-Learning, instructor-created information sources (courses, modules, experiments, etc.) are part of big data management systems, also called big learning data systems, according to the organization or experts. However, they also primarily consist of student data collected by Learning Management Systems, social networks, and multimedia (Banica & Radulescu, 2015). Sources of Big Data in universities have been identified in literature. They include demographics, such as age, sex, location and professional background. Ozioma, etal (2021), in their work listed the benefits of Big Data management system, such as; Better instruction, matching students with programs and jobs, open and transparent financing of education, and effective system administration.

The development of lecturers' ICT abilities demonstrated that lecturers lacked proficiency in the creation and presentation of slides, spreadsheet creation, and computer-aided data analysis (Akinnagbe & Baiyeri, 2011). Because there is a widespread lack of ICT infrastructure and related software, managing the complicated data that comes from student enrollment, exams and examination records, and even financial problems has traditionally been done hastily or under a lot of stress. A platform that can process Big Data should also be able to manage its diversity, velocity, and volume. This may be done by employing a family of components that need integration and data governance (Mules, 2016). Few employees at Nigerian institutes of higher learning are really knowledgeable about these procedures. As a result, it is reasonable to anticipate that the problems facing the implementation of big data in Nigerian higher education would be enormous and scary. However, given the researchers were unaware of any actual data demonstrating that lecturers were involved in managing Big Data, it is plausible that the fear was all in the mind of the individual.

An inquiry demonstrates the creation, processing, and challenges with creating and using Big Data for evaluation in Nigeria (Esemonu et al, 2020). Forty-five specialists in educational evaluation and research were chosen using the purposive sample method. Interviews and written records served as the data collection's instruments. Descriptive statistics were employed in the analysis of the data to address the five research questions that framed the study. The results of the inquiry showed that the key sources of assessment data in Nigeria were identified by more than 95.5% of the experts questioned as secondary school internal and external tests and assessments as well as course work results. The experts claim that a lack of knowledge about the advantages and requirements of assessing large data processing and production (4.290.76) is the main problem. Many data are not analyzed, which results in the loss of a considerable deal of information. To improve student performance, among other things, it was advised that the stakeholders increase understanding of the importance of Big Data in the modern educational system.

Big data management systems are thought to be relatively recent. The significance of maintaining staff and student data across departments and faculties cannot be overstated, given the structure of the postsecondary institution. One new breakthrough that merits further academic study is the use of big data analytic methods to current issues in higher education. Dnuggets (2018) came to the conclusion that better and quick access to information for decision-making, more transparency, scalability, and improved change management are the main advantages of evaluating the value of big data for enterprises. This outcome was determined by a recent survey. This project was prompted by the need to investigate potential uses of a big data management system to address issues with the current state of education at Rivers State University.

3. Research Methodology

The research design utilized was descriptive. The study involved teachers from four government-owned universities in Nigeria: University of Port Harcourt, Imo State University, University of Benin, Kogi State University and University of Lagos. To collect the data, an online self-structured questionnaire was employed. The questionnaire employed a 4-point Likert scale, with a range of 4-1. Four hundred and forty-four of the 148 completed online surveys were accurate and fit for analysis. The data were analyzed using frequency of simple percentages and mean scores.

Decision Rule: Any item with a mean of 2.50 or above was accepted, and any item with a mean of 2.50 or below was rejected, according to the judgment.

4. Results and Discussion

Demographic Characteristics of the Respondents

The respondents consist of 148 lecturers from the five public universities in Nigeria. The results show that there were 69(47%) males and 79(53%) females. The result of the qualifications was: 43(29%) PhD, 65(44%) master's degree, and 40(27%) bachelor's degree. Rank results show 18(12%) Graduate Assistant, 36(24%) Assistant Lecturer, 24(16%) Lecturer II, 27(18%) Lecturer I, 19(13%) Senior Lecturer, 14(10%) Associate Professor, 10(7%) Professors. The result of the respondents' universities were; 39(26%) University of Port-Harcourt, 32(21%) University of Benin, 29(20%) Imo State University, 19 (13%) Kogi State University and 26 (18%) University of Lagos.

Table 1: Level of lecturers' awareness of Big Data management systems in universities South-South Region of Nigeria

To what extent is lecturers' awareness of Big Data management systems in Rivers State Universities?	**HA**	**A**	**SA**	**NA**	**Mean**	**Decision**
Flink	22	33	40	53	2.2	NA
Atlas.ti	17	29	40	62	2.0	NA
Pentaho	17	29	45	53	2.1	NA
Cassandra	24	27	43	54	2.1	NA
Stats IQ	17	30	48	53	2.1	NA
Couch DB	20	17	49	62	2.0	NA
Storm	24	27	50	49	2.2	NA
Cloudera	25	28	59	36	2.3	NA
Apache hadoop	18	22	56	52	2.0	NA

Table 1 shows the awareness of Big Data management systems by lecturers in universities in Nigeria based on a 4 point likert scale (4-1) of Highly Aware (HA), Aware (A), Somehow Aware (SA) and Not Aware (NA). It shows that respondents were not aware of Big Data management systems such as; Cloudera (2.3), storm (2.2), flink (2.2), apache hadoop (2.1), Cassandra (2.1), Pentaho (2.1), Stats IQ (2.1), atlas.ti (2.0), and Couch DB (2.0).

This result was hitherto supported by Esomonu et al (2020), they agreed that university staff are not well aware of current ICT tools for managing Big Data however, there are indications of ICT advocacy to educate them on the available tools. Eguavoen and Okodugha (2022), exposed the importance of awareness of the prospective advantages of Big Data tools to tertiary institutions. According to Anikweze et al. (2019), there is a significant disparity in lecturers' access to and use of Big Data at higher education institutions in north central Nigeria, which may be due to insufficient advocacy and training. Findings from this study suggest that the possibility of using Big Data management tools can be hinged on the awareness of the relevant Big Data management systems in universities.

Table 2: Advantages of Big Data Management Systems to Lecturers in Universities in Nigeria

Items	**SA**	**A**	**D**	**SD**	**Mean**	**Decision**
It arranges students' information details	62	51	17	19	3.0	Agree
It enhances lecturers teaching activities	49	62	22	15	3.0	Agree
It promotes learning activities	51	59	17	21	2.9	Agree
It ensures fast collection of information	54	60	15	17	3.0	Agree
It promotes accurate in evaluation of data	48	63	24	22	2.9	Agree
It facilitates the dissemination of data	60	46	25	17	3.0	Agree

Table 2 above shows the advantages of Big Data management systems to lecturers in universities in Nigeria based on a 4 point likert scale of ranging from Strongly Agree (SA), Agree (A), Disagree(D) Strongly Disagree (SD), it revealed that Big Data management systems arranges students information details (3.0), it enhances lecturers teaching activities (3.0), it ensure fast collection of information (3.0), it facilitate the dissemination of data (3.0), it promote accurate evaluation of data (2.9) and it promote learning activities (2.9).

This finding is in line with the findings of Ozioma et al. (2021), who identified the advantages of a big data management system, including improved instruction, matching students to programs, matching students to jobs, transparent financing of higher education, and effective system administration. Key advantages of evaluating the value of big data tools for enterprises, according to Dnuggets (2018), include better and more immediate access to information for making decisions, more transparency, scalability, and better management.

Table 3: Uses of Big Data Management Systems by Lecturers in Universities in Nigeria

Items	SA	A	D	SD	Mean	Decision
It is use for analyzing and interpreting research data	64	49	16	19	3.1	Agree
It is use to gather information for academic research	54	59	20	14	3.0	Agree
It is use to increase lecturers job performance	53	47	27	21	2.9	Agree
It facilitate lecturer collaboration with other lecturers	33	27	48	40	2.4	Disagree
It is used to store large amount data	51	47	26	24	2.8	Agree
It is use as a basis to examine lecturers ICT skills	14	25	59	50	2.0	Disagree
It is use to plan curriculum	31	19	42	56	2.2	Disagree
It is use for marking and grading	51	67	18	12	3.1	Agree

Table 4 above shows the uses of Big Data management systems by lecturers in Universities in Nigeria based on a 4 point Likert Scale of ranging from Strongly Agree (SA), Agree (A), Disagree(D) Strongly Disagree (SD). It therefore

reveal that Big Data management system issue for analyzing and interpreting research data (3.1), it is use for marking and grading (3.1), it is use to increase lecturers job performance (2.9), it is use to gather information for academic research (2.9) and it is used to store large data (2.8). While the respondents disagreed that it facilitates lecturer collaboration with other lecturers (2.4), it is use to plan curriculum (2.1) and it is use as a basis to examine lecturers ICT skills (2.0).

The results align with the quantitative evaluation of 35 Charter schools' different approaches conducted by Divyakant et al. (2012). One study found that one of the top five practices linked to measurable academic success is the use of big data tools to guide instruction. The data acquired might be used to create the most effective teaching plans, ranging from simple reading, writing, and math classes to more difficult college-level courses. A relational viewpoint claims that big data management systems appeal to higher education institutions because they allow them to strategically use their IT resources to increase performance, increase student resilience, and increase completion rates (Anikweze, 2019).

Table 4: Factors influencing the use of Big Data management systems by lecturers in universities South-South Region of Nigeria

Items	SA	A	D	SD	Mean	Decision
Large amount of data	47	53	27	21	2.9	Agree
Proliferation of technology	54	59	16	18	3.0	Agree
The need of privacy in records handling and management	51	47	24	26	2.8	Agree
variety in Big Data sources	49	62	19	18	3.0	Agree
Complexity of data	42	60	23	22	2.8	Agree
Availability of ICT skills	52	53	18	15	3.0	Agree

Table 4 above shows the Factors influencing the use of Big Data management systems by lecturers in universities in Nigeria based on a 4 point Likert Scale of ranging from Strongly Agree (SA), Agree (A), Disagree (D) Strongly Disagree (SD). It revealed that respondents agree that Proliferation of technology (3.0), Availability ICT skills (3.0), multiple Big Data sources (3.0), Large amount of data (2.9), The need of privacy in records handling and management (2.8) and Complexity of data (2.8) are factors influencing the use of Big Data management systems by lecturers in universities in Nigeria.

This study is consistent with Murumba and Micheni (2017), they identified pressing factors that necessitated the use of Big Data management systems in higher institutions of such are; increase in students and lecturer data, proliferation of ICT tools, the need to get accurate analysis and interpretation of multifaceted data related to the development of university education among others. Also, Kelechi et al (2020) pointed out that university need to be able to predict students' performance, optimize research for development and ultimately promote service delivery becomes a motivation for the adoption of Big Data management tool.

5. Conclusion

The survey on the awareness and utilization of big data management systems by lecturers in Nigerian universities sheds light on the current state of technological integration in higher education. The findings reveal a significant gap in awareness, as a considerable number of lecturers are still unfamiliar with the concept of big data management systems. This point to the need for comprehensive training programs and awareness campaigns to equip educators with the knowledge and skills necessary to harness the potential of these advanced technologies.

Moreover, the survey underscores the importance of addressing the challenges that hinder the effective utilization of big data systems in Nigerian universities. Issues such as inadequate infrastructure, limited access to relevant technology, and a lack of institutional support emerged as barriers that need urgent attention. Policymakers and university administrators must collaborate to address these challenges and create an environment conducive to the successful implementation of big data management systems.

As the global landscape of higher education continues to evolve, the integration of big data management systems becomes imperative for universities to stay competitive and relevant. Nigerian universities, in particular, must embark on a transformative journey to embrace these technological advancements. The survey findings serve as a catalyst for universities to invest in the necessary resources, foster a culture of innovation, and prioritize the integration of big data management systems into academic practices. Ultimately, by bridging the awareness gap and overcoming implementation challenges, Nigerian universities can position themselves at the forefront of educational excellence in the digital age.

6. Recommendations

The study recommends that:

Universities in Nigeria should design and implement comprehensive training programs focused on raising awareness and building the necessary skills among lecturers regarding big data management systems. These programs should cover the basics of big data, its applications in academia, and hands-on training to ensure that lecturers are well-equipped to integrate these systems into their teaching and research activities. Collaborations with industry experts and technology companies can enhance the effectiveness of such programs.

Universities need to invest in the necessary infrastructure and technology. This includes providing access to robust computing resources, high-speed internet, and data storage facilities. Additionally, universities should explore partnerships with technology providers to ensure that lecturers have access to state-of-the-art tools and platforms, fostering a conducive environment for the implementation of big data solutions

Universities should develop and implement policies that support the integration of big data management systems into academic activities

Universities should encourage interdisciplinary research projects that leverage big data for innovative solutions. Additionally, creating platforms for knowledge sharing, such as workshops, conferences, and online forums, can foster a community of practice where lecturers can exchange ideas, best practices, and experiences related to big data in academia.

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